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# THE AMERICAN CHARACIDAE.

BY  
CARL H. EIGENMANN.

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WITH TWENTY-EIGHT PLATES.



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*Specimens examined.*

| Catalogue number  | Number of specimens | Size in mm.        | Locality                   | Collector |
|-------------------|---------------------|--------------------|----------------------------|-----------|
| 3018 C. Type      | 1                   | 48                 | Campos                     | Haseman   |
| 3019 C. Paratype  | 1                   | 49                 | Morretes                   | Haseman   |
| 3020 C. Paratypes | 7                   | 40-43              | Muniz Freire               | Haseman   |
| 3021 C. Paratype  | 1                   | 45                 | Mogy das Cruzes, Rio Tieté | Haseman   |
| 3022 C. Paratypes | 8                   | 40-46              | Iguape                     | Haseman   |
| 3022 i-m C.       | 5                   | 15-18 <sup>1</sup> | Iguape                     | Haseman   |
| 2946 C. Paratype  | 1                   | 26                 | Cacequy                    | Haseman   |
| 3586 C. Paratype  | 1                   | 30                 | Rio Doce                   | Haseman   |

Head 3.5-3.7; depth 2.5 or 2.6; D. 11; A. 18 to 21; scales 6 to 7-31 to 34-4 to 5; eye 2.7 to 3 in the head. Interorbital a little more than the eye, 2.2 in the head.

Compressed, depth of the head at base of the occipital process 1.5 in the greatest depth. Preventral region rounded, without complete median series of scales. Predorsal region usually with a regular series of 11 to 14 median scales.

Occipital process 6 in the distance from its base to the dorsal, bordered by 2 scales. Interorbital nearly flat. Frontal fontanel triangular, as wide as the parietal and three fourths as long as the parietal without the occipital groove. Second suborbital in contact with the preopercle below and behind. Maxillary equal to the eye, mandible a little longer than the eye, 2.1 in the head. Mouth large, snout very short. Premaxillary with three to five tricuspid teeth in the outer row, and five 3- to 5-pointed teeth in the inner row. Maxillary rarely without teeth, usually with one small 3- to 5-pointed tooth. Dentary with a graduated series of four or five 3- to 5-pointed teeth followed by one or two small, tricuspid teeth and five or six very minute conical ones on the side.

Gill-rakers 7 + 9.

Anal sheath of about nine scales covering the bases of the first 10 rays. Lateral line with pores developed on the first 5 to 7 rays.

Origin of the dorsal the length of the eye nearer to the caudal than to the snout, penultimate ray 2.5 in the longest, which is 4.25 in the length. Caudal a little longer than the head. Origin of the anal on the vertical from the fifth to eighth dorsal rays. Base of anal convex. Anal subtruncate or only slightly emarginate, the longest ray 1.5 in the base. Ventrals on the vertical from the fourth scale in front of the dorsal. Ventrals just reaching the anal. Pectorals little more than just reaching the ventrals.

<sup>1</sup> Without the caudal; pectorals archaic.



Humeral spot intense black, round, but with faint vertical elongations, sometimes surrounded, more often followed, by a light area. Caudal spot irregular, more intense on the fin than on the caudal peduncle, not extending as far as half way to the end of the middle caudal rays. A narrow but intense lateral stripe in the region above the anal, fading out just before it joins the caudal spot and just in front of the vertical from the dorsal. A dark line along the base of the anal. Fins all dusky, especially the anal and lower lobe of the caudal. Scales all clearly outlined with brownish. Cheeks and back thickly peppered with brown chromatophores.

## 28. HYPHESSOBRYCON DURAGENYS Ellis.

Plate 30, fig. 1.

*HypheSSobrycon duragenys* ELLIS, Ann. Carnegie mus., 1911, 8, p. 155, pl. 2, fig. 3.

HABITAT.—Rio Parahyba and Rio Tieté Basins.

### *Specimens examined.*

| Catalogue<br>number | Number of<br>specimens | Size<br>in mm. | Locality                   | Collector |
|---------------------|------------------------|----------------|----------------------------|-----------|
| 3023 C. Type        | 1                      | 68             | Mogy das Cruzes, Rio Tieté | Haseman   |
| 3024 C. Paratypes   | 5                      | 45-53          | Mogy das Cruzes            | Haseman   |
| 3025 C. Paratypes   | 9                      | 28-43          | Jacarehy                   | Haseman   |

Head 3.25-3.7; depth 2.5; D. 10 to 12; A. 16 to 18; scales 5 or 6-32 to 36-4 to 5; eye small, 3.0 to 3.5 in the head; interorbital wider than the length of the eye, 2.8 to 3.2 in the head.

Compressed. Depth of the head at the base of the occipital process 1.5 in the greatest depth. Preventral and predorsal regions rounded, usually without complete series of median scales.

Occipital process about 5 in the distance from its base to the dorsal, bordered by 3 or 4 scales. Interorbital only slightly convex. Frontal fontanel triangular, as wide as the parietal, and one half to three fourths as long as the parietal without the occipital groove. Second suborbital usually in contact with the preopercle. Third suborbital about one half as wide as the eye. Mouth moderately large; snout short. Maxillary equal to the eye. Mandible longer than the eye, 2.5 to 3 in the head. Premaxillary with three or four tricuspid teeth in the outer row, and a graduated series of five 3- and 5-pointed teeth in the inner row. Maxillary with one tricuspid tooth. Dentary with a graduated



series of four 5-pointed teeth followed by three or four narrow, conical ones on the sides.

Gill-rakers 8 + 10.

Anal sheath short, of about five scales covering the base of the first 7 rays. Lateral line with pores developed on 9 to 12 scales.

Origin of the dorsal a little more than one half the eye nearer to the caudal than to the snout; penultimate ray one half the longest, which is 3.5 to 4 in the length. Caudal not as long as the head. Origin of the anal on the vertical from the first or second scale behind the dorsal. Anal obliquely truncate, the longest ray 1.33 in the base. Ventrals on the vertical from the third scale in front of the dorsal. Ventrals reaching the second or third scale in front of the anal. Pectorals reaching the first or second scale in front of the ventrals.

Humeral spot narrow and vertically elongate. Caudal spot intensely black, tapering forward into the lateral stripe, more suddenly constricted behind and continued to the end of the middle caudal rays. Lateral stripe overlaid with silvery; distal third of the anal more or less dusky. Scales of the back dusky; scales of the sides, especially below the lateral stripe, with a silvery blue iridescence.

One specimen 73 mm., Rio das Velhas, (C. 3076a). Varies from typical specimens as follows:—Depth 3.2. Maxillary with three tricuspid teeth; caudal spot diffuse; humeral spot triangular, longest in the vertical elongation but most intense at the posterior and horizontal limb.

## 29. *HYPHESSOBRYCON POECILIOIDES* Eigenmann.

*Hyphessobrycon poecilioides* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 29 (Cali).

HABITAT.—Cauca Basin.

### *Specimens examined.*

| Catalogue number     | Number of specimens | Size in mm. | Locality | Collector |
|----------------------|---------------------|-------------|----------|-----------|
| 5091 C. Type         | 1                   | 53          | Cali     | Eigenmann |
| 5092 C. Paratypes {  | 50                  | 69          | Cali     | Eigenmann |
| 12850 I. Paratypes } |                     |             |          |           |

Head 3.66–3.75; depth 2.66 ♀ –3 ♂; D. 11; A. 16–18; scales 36 in a longitudinal series, 12 series; usually about 9 scales with pores, rarely as many as 16; eye 4 in head, 1.66–2 in interorbital, equal to snout; depth of caudal peduncle 2.66–2.9 in the greatest depth.



Cyprinodontoid. Ventral surfaces rounded, the scales rather small, no distinct median series; about 12 scales in front of the dorsal, in a nearly regular series; interorbital but slightly convex, mouth very small, the maxillary very oblique, usually not quite equal to the eye; maxillary-premaxillary border three in the head; second suborbital sometimes covering the entire cheek, usually leaving a naked border behind and a naked triangle under its anterior angle; premaxillary with three to five teeth in the outer series; maxillary with one (sometimes none or two?) 5-pointed tooth; mandible with four graduated large teeth and two to five small ones on the sides.

Gill-rakers 11 + 15.

Dorsal a little nearer caudal than snout, its margin rounded; caudal lobes short, about equal to length of head; depth of caudal peduncle less than its length; anterior rays of anal the longer, the margin very slightly emarginate, its origin on the vertical from or behind the vertical from the base of the last dorsal ray; ventrals not reaching anal; pectorals short, rounded, about equal to head less snout and half the eye, not reaching ventrals by about three scales.

Scales regularly imbricate; no interpolated rows below the lateral line; caudal naked, a basal sheath of one row of scales along the anterior part of the entire anal; a small axillary scale.

Sides of head and body thickly covered with chromatophores; a wedge-shaped humeral spot crossing the third to fifth scale of the lateral line; a narrow black (in formaline) band from upper angle of gill-opening to end of middle caudal rays.

Anal tubercles in male scarcely evident.

### 30. *HYPHESSOBRYCON BELLOTTII* (Steindachner).

Plate 79, fig. 8.

*Tetragonopterus bellottii* STEINDACHNER, Flussf. Südamer., 1882, 4, p. 34 (Tabatinga); Eigenmann & Eigenmann, Proc. U. S. N. M., 1891, 14, p. 53; Ulrey, Ann. N. Y. acad. sci., 1895, 8, p. 286 (Santarem).

*Hemigrammus bellottii* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 14.

*Hyphessobrycon bellottii* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 437.

HABITAT.—Amazons.

#### *Specimens examined.*

| Catalogue number | Number of specimens | Size in mm. | Locality    | Collector |
|------------------|---------------------|-------------|-------------|-----------|
| 31507            | 4                   | 23-34       | Villa Bella | Agassiz   |
| 5174 I.          | 5                   | 25-32       | Brazil      | Hiatt.    |



Head 3.2–3.75; depth 2.9–4; D. 11; A. 22–26; scales 5–31 to 33–3 or 3.5. Lateral line with pores on 5 to 10 scales. (One specimen had pores on 15 scales). Eye 2.5 in head; interorbital three in the head.

Compressed. Depth of head at the base of the occipital process 1.5 in the greatest depth. Preventral region rounded, without complete median series of scales. Predorsal region rounded, with a complete series of median scales.

Occipital process 4 in the distance from its base to the dorsal, bordered by 3.5 scales. Interorbital slightly convex. Frontal fontanel triangular, two thirds of the parietal without the occipital groove. Second suborbital leaving a narrow naked margin below and behind. Mouth large. Maxillary 3.5 in the head, three fourths of the eye. Mandible longer than the eye, 2.4 in the head. Premaxillary with an inner row of five 3- to 5-pointed teeth and an outer row of two to five conical to narrowly tricuspid teeth. Maxillary with two, rarely one, conical or 3-pointed tooth. Dentary with a series of four graduated, 3- to 4-pointed teeth, followed by from four to nine minute conical ones.

Gill-rakers 13 + 6, the last four on the horizontal limb very small.

Anal sheath short, consisting of four or five scales. Lateral line with pores on 5 to 10 scales, rarely on as many as 15.

Origin of the dorsal equidistant from the snout and the caudal, penultimate ray one third of the longest ray, which is 3 to 3.25 in the length. Origin of the anal on the vertical from the second scale in front of the dorsal. Ventrals just reaching the anal. Pectorals just reaching the ventrals.

Humeral spot intense brown on a light circle or oval, covering the fourth and fifth scales of the series just above the lateral line. A slim lateral stripe of brown overlaid with a wider indistinct silvery stripe. No caudal spot. Sides over the body-cavity somewhat iridescent. Fins hyaline or uniformly a little dusky. Specimens from Villa Bella have the scales of dorsal aspect outlined with pigment and a few chromatophores scattered along the lateral stripe.

Aside from having the dorsal scales outlined with pigment the specimens from Villa Bella differed from those from Brazil (Hiatt Coll.) in being much deeper. The original description of Steindachner gives 3.4 to 3.33 as the depth of *bellottii*, the present specimens from Villa Bella are 2.4 to 3.33, those from Brazil 3.67–3.9.



31. *HYPHESSOBRYCON BIFASCIATUS* Ellis.

Plate 30, figs. 2, 3.

*Hyphessobrycon bifasciatus* ELLIS, Ann. Carnegie mus., 1911, 8, p. 156, pl. 2, fig. 4; pl. 3, fig. 1.

HABITAT.—Southeastern Brazil.

*Specimens examined.*

| Catalogue number | Number of specimens | Size in mm. | Locality          | Collector |
|------------------|---------------------|-------------|-------------------|-----------|
| 2935 C. Cotypes  | 27                  | 16–24, 41   | Cacequy           | Haseman   |
| 2936 C. Cotypes  | 39                  | 26–46       | Muniz Freire      | Haseman   |
| 3026 C. Cotypes  | 2                   | 44♂, 37 ♀   | Campos            | Haseman   |
| 3027 C. Cotypes  | 35                  | 29–44       | São João da Barra | Haseman   |
| 3028 C. Cotypes  | 2                   | 41, 38      | Xiririca          | Haseman   |
| 3029 C. Cotypes  | 1                   | 40          | Porto Alegre      | Haseman   |
| 3030 C. Cotypes  | 2                   | 35♂, 47 ♀   | Morretes          | Haseman   |
| 3031 C. Cotypes  | 78                  | 29–47       | Campos            | Haseman   |
| 3032 C. Cotypes  | 13                  | 31–44       | Lagoa Feia, Tocas | Haseman   |

Head 3.8; depth 2.5; D. 11; A. 29–32; scales 6 or 7–33 to 36–5 or 6; eye 2.3 to 2.5 in the head; interorbital almost equals the eye, 2.8 in the head.

Compressed. Depth of the head at the base of occipital process 1.67 in the greatest depth. Preventral and predorsal regions rounded, without complete series of median scales.

Occipital process about 5 in the distance from its base to the dorsal. Interorbital slightly convex. Frontal fontanel triangular, as wide as the parietal and four fifths as long as the parietal without the occipital groove. Second suborbital leaving a naked margin, equal to half its own width, behind and below. Maxillary not quite equal to the eye, a little more than 3 in the head. Mandible equal to the eye. Mouth moderate, snout .5 in the eye. Premaxillary with three or four narrow, tricuspid or broadly conical teeth in the outer row, and four or five 5- to 7-pointed teeth in the inner row. Maxillary with one 3- or 5-pointed tooth of medium size. Dentary with a weakly graduated series of four, sometimes five 5- to 7-pointed teeth followed by two or three quite small ones on the sides.

Gill-rakers 6 + 10.

Scales on the ventral half of the sides face a little obliquely backwards and downwards, especially in the region directly over the base of the anal where they are often more or less crowded. A small scale interpolated at the base



of each anal ray. The first 11 to 13 of these interpolated scales larger and extending onto the base of the rays so as to form a short anal sheath. Lateral line with pores on the first 6 to 9 scales.

Origin of the dorsal equidistant from the snout and caudal; penultimate ray about one third of the longest which is 3.33-3.67 in the length. Caudal a little shorter than the head. Origin of the anal on the vertical from the eighth dorsal ray. Anal of male somewhat rounded, the last ray one half the longest which is almost twice the length of the eye. Anal armature developed as a series of small recurved hooks on each of the first fifteen to twenty rays. Anal of the female emarginate, the longest ray 1.67 in the anal's base; the last rays much shorter than in the males of equal size. Ventrals on the vertical from the first or second scale in front of the dorsal, barely reaching the anal in females but prolonged to the base of the seventh to tenth anal rays in males. Pectorals just reaching the ventrals.

A vertically elongate humeral spot, followed by a bright bar, and a second dusky bar extending almost entirely across the sides. Seven to twelve black V-shaped lines, the angle toward the head, along the very faint silvery lateral stripe. No caudal spot. Fins all somewhat dusky except along the outside of the ventrals of the males and sometimes at the bases of the caudal and anal in females. Scales of the back and upper half of the sides outlined with dusky. The region over the anal with many large pale chromatophores. The very young specimens, 16-24 mm., from Cacequy had all the markings very poorly developed, the chromatophores being more evenly distributed.

### 32. HYPHESSOBRYCON CATABLEPTUS (Durbin).

*Dematocheir catablepta* DURBIN, Ann. Carnegie mus., 1909, **6**, p. 55; EIGENMANN, Mem. Carnegie mus., 1912, **5**, p. 343.

HABITAT.—Guiana.

One specimen 1198 C. Type. 18 mm. Tumatumari, above the Falls. Eigenmann.

Head 3.5; depth 3.8; D. 11; A. 20; scales 5-33-3; eye 2.5 in the head; interorbital very slightly greater than the eye 2.2 in head.

Compressed. Depth of head at the base of the occipital process very nearly equal to the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded.

Occipital process short. Interorbital flat. Frontal fontanel triangular,



narrower than the parietal, slightly longer than the parietal without the occipital groove. Second suborbital leaving a narrow naked margin behind and below. Mouth moderately large; snout short, about half the length of the eye. Maxillary 1.25 in the eye. Mandible equal to the eye. Premaxillary with five small conical teeth in the outer row and five tricuspid teeth in the inner row. Maxillary with seven small conical teeth closely packed together. Dentary with a series of four rather broad tricuspid teeth. Probably followed by several minute ones on the sides.

Caudal naked. Anal sheath reduced to a single small scale not extending onto the first anal rays. Pores developed on the first 9 scales of the lateral line, the rest of the scales in the series with a shallow notch on the free margin.

Origin of the dorsal equidistant from the snout and caudal; penultimate ray 1.66 in the longest which is 3.2 in the length. Caudal not so long as the head. Origin of the anal on the vertical from the second scale behind the dorsal. Anal emarginate, the longest ray about 1.33 in the length of the base. Ventrals on the vertical from the first dorsal ray. Ventrals just reaching the anal. Pectorals short and paddle shaped with a fringe of soft rays.

Humeral spot vertically elongate, very faint. No caudal spot but a few chromatophores at the base of each caudal lobe. Lateral stripe very dim. Scales of the back outlined with dusky. Fins without pigment.

### 33. *HYPHESSOBRYCON STICTUS* Durbin.

Plate 22, fig. 1.

*Hyphe ssobrycon stictus* DURBIN, Ann. Carnegie mus., 1909, 6, p. 71; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 437; Mem. Carnegie mus., 1912, 5, p. 342, pl. 49, fig. 7.

HABITAT.—Guiana, Amazon.

#### *Specimens examined.*

| Catalogue number            | Number of specimens | Size in mm. | Locality             | Collector |
|-----------------------------|---------------------|-------------|----------------------|-----------|
| 1197 C. Type                | 1                   | 38          | Lama Stop-Off        | Eigenmann |
| 1435 C., 11895 I. Paratypes | 108                 |             | Maduni Creek         | Eigenmann |
| 1436 C., 11896 I. Paratypes | 117                 | 22-39       | Lama Stop-Off        | Eigenmann |
| 1437 C. Paratype            | 1                   |             | Rockstone            | Eigenmann |
| 1438 C., 11897 I. Paratypes | 10                  |             | Christianburg Canal  | Eigenmann |
| 1439 C. Paratype            | 1                   |             | Cane Grove Corner    | Eigenmann |
| 3079 C.                     | 4                   | 33-36       | Santarem             | Haseman   |
| 3080 C.                     | 2                   | 36-40       | Manaos               | Haseman   |
|                             | 110                 | 27-43       | Hubabu Creek, Guiana | Ellis     |



Head 3.5 to 3.8; depth 2.75 to 3.25; D. 11; A. 26-31; scales 6-33 to 35-4; eye 2.25 in head, snout 2 in the eye; interorbital less than the eye, about 2.5 in head.

Compressed. Depth of head at the base of the occipital process 1.33 to 1.5 in the greatest depth. Preventral region rounded, without regular complete series of median scales. Predorsal region rounded, with complete series of 9 to 11 median scales.

Occipital process 5 in the distance from its base to the dorsal, bordered by 5 scales. Interorbital very slightly convex. Frontal fontanel large, triangular, only slightly narrower than parietal, as long as the parietal without the occipital groove. Second suborbital leaving naked margins behind and below. Mouth moderately large; snout short. Maxillary not so long as the eye. Mandible equal to the eye. Premaxillary with two or three, rarely four, small 5- to 7-pointed teeth in the outer row, and five large 7- to 9-pointed teeth in the inner row. Maxillary with one to three broad 7-pointed teeth. Dentary with five or six large 7- to 9-pointed teeth followed by two or three very small, but multicuspid teeth on the side.

Gill-rakers about 5 + 11.

Base of the caudal sometimes a very little scaled, the broad terminal scale often wanting. Anal sheath short, composed of four scales covering the bases of the first 6 rays. Pores on 7 to 11 scales.

Origin of the dorsal a third the length of the eye nearer the base of the caudal than the snout; penultimate rays 4 in the longest which is 2.5 to 2.67 in the length. Origin of anal on the vertical from the last dorsal ray; longest ray 1.66 in the base which is 1.2 times the head. Ventrals on the vertical from the first or second scale in front of the dorsal. Ventrals just reaching the anal. Pectoral never reaching beyond the second scale in front of the ventrals.

Humeral spot round, very intense, surrounded by a light ring; the center of humeral spot equidistant from posterior margin of the eye and the dorsal; very frequently a less intense dark bar extending obliquely downwards and forwards, and another shorter one extending obliquely upwards and forwards. A faint secondary humeral spot the width of two scales behind the first. Lateral stripe sharp and very narrow, not reaching the caudal. No caudal spot. Dorsal scales outlined with dusky. Sides silvery iridescent.

Caudal peduncle to in front of adipose, the adipose and caudal except the lobes richest cherry-red. Caudal lobes, anal, and dorsal canary-yellow.

A specimen from Lama Stop-Off 24 mm. has more than ordinary number of scales on the caudal and only 19 anal rays.



34. *HYPHESSOBRYCON ECUADORIENSIS* Eigenmann and Henn.

Plate 93, fig. 6.

*Hyphessobrycon ecuadoriensis* EIGENMANN & HENN, Indiana univ. studies, 1914, no. 19, p. 9 (Vinces).

HABITAT.—Ecuador.

*Specimens examined.*

| Catalogue<br>number  | Number of<br>specimens | Size<br>in mm. | Locality                | Collector |
|----------------------|------------------------|----------------|-------------------------|-----------|
| 13105 a I. Type      | 1                      | 31             | Near Vincennes, Ecuador | Henn.     |
| 13105 b I. Paratypes | 200+                   |                | Near Vincennes, Ecuador | Henn.     |
| 5417 a-x Paratypes   | 200+                   |                | Near Vincennes, Ecuador | Henn.     |

Head 3.5; depth 2.6–3; depth of caudal peduncle 7–8; D. 11; A. 22–24; scales about 30 in a longitudinal series, about 11 in a cross-series, but few scales with pores; eye 3 in head, greater than interorbital.

Compressed, rather deep, caudal peduncle slender. Predorsal area rounded, with a median series of about 11 scales. Preventral area rounded, without distinct median series of scales.

Skull smooth, fontanelles very large; second suborbital with a strongly convex margin, leaving but a narrow naked margin; mouth oblique, terminal, the maxillary short, only two thirds the length of the eye. Premaxillary with six or eight teeth, the lateral one conic the rest all tricuspid, a smaller tricuspid tooth in front of the space between the second and third of the inner series, occasionally between them and forming a continuous series with them. Maxillary with none to three minute teeth; mandible with ten or more graduate teeth of which the anterior ones are tricuspid the rest conical.

Gill-rakers well developed on both arches.

Origin of dorsal a little behind the middle, its height 4 in the length, adipose well developed; height of anal lobe 4.5 in the length, caudal lobes 3. Origin of anal under middle of dorsal. Ventrals reaching anal or further, pectorals to or beyond origin of ventrals. Lateral line developed on 5 or 6 scales.

A conspicuous vertical black humeral spot, sides gray, no caudal line, no silvery lateral band or caudal spot, caudal and anal obscurely margined with dark.

Color in life brilliant; ventrals, anal, and caudal bright cherry-red, dorsal sometimes with less red; region above anal with many cherry chromatophores.



Allied to *H. panamensis* from which specimens of equal size differ in the wider second suborbital, the broader predorsal area, the smaller eye, the shorter anal, the color, etc.

35. *HYPHESSOBRYCON HETERORHABDUS* (Ulrey).

Plate 28, fig. 3; Plate 79, fig. 10.

*Tetragonopterus heterorhabdus* ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 286 (Para; Brazil).

*Hemigrammus heterorhabdus*, EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 14.

*Hyphessobrycon heterorhabdus*, EIGENMANN, Rept. Princeton univ., Exped. Patagonia, 1910, 3, p. 437;

ELLIS, Ann. Carnegie mus., 1911, 8, p. 159 (Bragança).

HABITAT.— Lower Amazon.

| Catalogue<br>number | Number of<br>specimens | Size<br>in mm. | Locality | Collector |
|---------------------|------------------------|----------------|----------|-----------|
| 5496 I. Cotypes     | 8                      | 6–26           | Brazil   | Hartt     |
| 5500 I. Cotypes     | 5                      | 17–24          | Para     | Hartt     |
| 3004 C.             | 2                      | 29, 33 (about) | Bragança | Haseman   |

Head 3.5–3.75; depth 3–3.5; D. 10; A. 20–23; scales 5–32 to 34–3; eye 2.5 in the head; interorbital equals the eye.

Compressed. Depth of head at the base of the occipital process 1.25 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded, with complete series of 11 median scales.

Occipital process 6 to 7 in the distance from its base to the dorsal, bordered by 2.5 to 3 scales. Interorbital convex. Frontal fontanel triangular, four fifths the length of the parietal without the occipital groove. Second suborbital leaving a naked margin behind and below. Maxillary equal to the eye. Mandible almost imperceptibly longer. Mouth large. Premaxillary with four or five, 3- to 5-pointed teeth in the inner, and four conical or narrowly tricuspid ones in the outer row. Maxillary with four conical teeth. Dentary with a graduated series of four, 3- to 4-pointed teeth and three or four minute conical ones on the sides.

Gill-rakers 7 + 12.

Anal sheath short, probably of about three scales. Lateral line with pores on 8 or 9 scales.

Origin of the dorsal equidistant between the snout and caudal, the penultimate ray 2.5 to 3 in the longest, a little less than 4 in the length. Origin of the anal on the vertical from the last dorsal ray. Anal emarginate. Ventrals on the vertical from the second scale in front of the dorsal. Ventral not reaching the anal; pectorals not reaching the ventrals.



Caudal spot absent. Humeral spot represented by the expansion of the anterior end of a very distinct broad lateral stripe which is bordered above with a silvery band. A crescent of silvery bordering the lower side of the humeral expansion of the lateral stripe. The scales below the stripe slightly iridescent.

36. *HYPHESSOBRYCON MELANOPLEURUS* Ellis.

Plate 30, fig. 4.

*Hyphessobrycon melanopleura* ELLIS, Ann. Carnegie mus., 1911, 8, p. 157, pl. 3, fig. 2.

HABITAT.—Rio Tieté Basin.

*Specimens examined.*

| Catalogue<br>number | Number of<br>specimens | Size<br>in mm. | Locality                 | Collector |
|---------------------|------------------------|----------------|--------------------------|-----------|
| 3035 C. Type        | 1                      | 34             | Alto da Serra, São Paulo | Haseman   |
| 3036 C. Cotypes     | 2                      | 32, 35         | Alto da Serra, São Paulo | Haseman   |

Head 3.8; depth 3.2 to 3.5; D. 10 or 11; A. 26 to 28; scales 6 or 7–30 to 36–5; eye 3 in the head; interorbital a little greater than the eye, 2.5 in the head.

Compressed. Depth of head at the base of the occipital process 1.3 in the greatest depth. Preventral and predorsal regions narrowly rounded, without complete series of median scales.

Occipital process short, about 8 in the distance from its base to the dorsal. Interorbital nearly flat. Frontal fontanel narrowly triangular, as wide as the parietal and 1.5 in the parietal without the occipital groove. Maxillary a little less and mandible a little more than the eye. Mouth rather large; snout very short, 1.8 in the head. Premaxillary with four tricuspid teeth in the inner row, and two or three slightly narrower teeth in the outer row. Maxillary with four or five narrow tricuspid to conical teeth. Dentary with a series of four strong tricuspid teeth, followed by about seven minute conical ones on the side.

Gill-rakers 6 + 9, each with a single row of very small spines.

Lateral line with pores developed on 7 to 9 scales.

Origin of the dorsal nearly the length of the eye nearer the caudal than to the snout; highest dorsal ray 1.3 in the head. Origin of the anal on the vertical from the third dorsal ray. Anal rather deeply emarginate; longest anal ray about 2 in the base of anal and about 1.7 in the head. Ventrals on the vertical from the fourth or fifth scale in front of the dorsal. Ventrals short and weak,



scarcely reaching the first long anal rays. Pectorals large, reaching beyond the middle of the ventrals.

Ground color light; a broad blackish stripe from the eye to the end of the middle caudal rays, becoming fainter behind the adipose; a very faint lateral elongation of the lateral stripe in the region of the humeral spot. A faint, dusky, oblique stripe across the dorsal from the base of the first to the tips of the seventh and eighth rays. All of the fins a little dusky. Scales of the back heavily outlined with dusky, top of the head and lips quite dark. Sides and head silvery between the lateral stripes.

### 11. HASEMANIA Ellis.

For John Haseman.

*Hasemania* ELLIS, Ann. Carnegie mus., 1911, 8, p. 148.

TYPE.—*Hasemania melanura* Ellis.

A Tetragonopterid, with two rows of premaxillary teeth, the maxillary without teeth or with a few teeth in its upper angle, the lateral line incomplete, the caudal naked. No adipose fin. Like *Hyphessobrycon* but without an adipose. Pectoral frequently archaic in small specimens.

HABITAT.—Southeastern Brazil.

#### *Key to the Species.*

- a. Maxillary equal to the eye, with two small tricuspid teeth. Premaxillary teeth narrow, tricuspid or conical. Snout sharp; interorbital narrow, less than the eye, 4 in the head. D.11; A. 19; scales 7-32-5 or 6.....1. *maxillaris* Ellis.
- aa. Maxillary less than the eye, elliptical, without teeth. Teeth in the inner row of the premaxillary with more than 3 points. Interorbital 3 or less, in the head.
  - b. Snout short and blunt. Dentary with four or five 5- or 6-pointed teeth. A distinct blackish caudal spot extending to the tips of the middle caudal rays. D.11; A.16 to 18; scales 6-33 to 36-5.....2. *melanura* Ellis.
  - bb. Dentary with three broad chisel-shaped, 8- or 9-pointed teeth. No distinct caudal spot; a heavy black lateral stripe, another black stripe along the underside of the caudal peduncle extending to the base of the last anal ray and continued in a straight line to just above the first anal ray. D.11; A.14 to 17; scales 5-33 or 34-4.....3. *bilineata* Ellis.

### 1. HASEMANIA MAXILLARIS Ellis.

Plate 31, fig. 1.

*Hasemania maxillaris* ELLIS, Ann. Carnegie mus., 1911, 8, p. 148, pl. 1, fig. 1.

One specimen 2937 C. Type. 29 mm. Porto Uniao, Rio Iguassú. Haseman.

Head 3; depth 3; D. 11; A. 19; scales 7-32-5 or 6; eye 3 in the head; interorbital less than the eye, about 4 in the head.



Compressed. Depth of head at the base of the occipital process 1.2 in the greatest depth. Preventral region rounded. Predorsal region rounded, without a regular series of median scales.

Occipital process a little more than 5 in the distance from its base to the dorsal. Interorbital nearly flat. Frontal fontanel triangular, as wide as the parietal, and two thirds as long as the parietal without the occipital groove. Second suborbital with a wide naked margin behind and below. Mouth large; snout pointed rather short. Maxillary equal to the eye. Mandible longer than the eye, 2.4 in the head. Premaxillary with five tricuspid and conical teeth in the inner row and three conical teeth in the outer row. Maxillary with two conical teeth. Dentary with five or six tricuspid teeth, followed by three to six very small conical ones on the sides.

Gill-rakers 6 + 9.

Scales cycloid, striae crooked, more numerous near the sides of the free margin of the scale, variable in number (18+). Caudal naked. No anal sheath extending over the rays of the fin, but a series or part of a series of small scales along the base of the anal. Lateral line with pores developed on about 6 scales.

Origin of the dorsal the length of the eye nearer to the caudal than to the snout, its longest ray about 4.5 in the length. Caudal probably about 1.33 in the head. Origin of the anal on the vertical from the ninth dorsal ray. Anal truncate. Ventrals on the vertical from the first dorsal ray, very short, just reaching the second scale in front of the anal. Pectorals archaic. Adipose lacking.

No humeral spots. A faint caudal spot not continued on the rays. Lateral stripe very faint. Dorsal, caudal, and ventrals uniformly dusky; distal half of anal dusky. All the scales, excepting those in the preventral region outlined with dusky; much darker along the back; silvery except along the back.

## 2. HASEMANIA MELANURA Ellis.

Plate 31, fig. 2.

*Hasemanian melanura* ELLIS, Ann. Carnegie mus., 1911, 8, p. 149, pl. 1, fig. 2.

HABITAT.—Rio Iguassú, southeastern Brazil.

### *Specimens examined.*

| Catalogue number  | Number of specimens | Size in mm. | Locality                 | Collector |
|-------------------|---------------------|-------------|--------------------------|-----------|
| 3002 C. Type      | 1                   | 35          | Porto Uniao, Rio Iguassú | Haseman   |
| 3003 C. Paratypes | 49                  | 25-44       |                          |           |



Head 3.2 to 3.7; depth 2.6 to 2.8; D. 11; A. 16 to 18; scales 6-33 to 36-5; eye rather small, 3 in the head; interorbital equal to or greater than the eye, 2.8 to 3 in the head.

Compressed. Depth of head at the base of the occipital process 1.6 in the greatest depth. Predorsal region rounded, with or without a complete series of 11 median scales.

Occipital process short, about 6 in the distance from its base to the dorsal, bordered by 2 or 3 scales. Frontal fontanel an almost equilateral triangle, narrower than the parietal fontanel and 1.6 in the parietal without the occipital groove. Second suborbital leaving a naked margin behind and below. Snout short and moderately blunt, less than the eye, 4 in the head. Maxillary shorter than the eye, equal to the length of the snout, elliptical in outline, the front and back not parallel. Mandible equal to the eye. Premaxillary with four or five 5- to 7-pointed teeth in the inner row, and three 3-pointed teeth in the outer row. Maxillary without teeth. Dentary with a graduated series of four or five 5- or 6-pointed teeth, followed by four or five minute ones on the sides.

Gill-rakers 6 + 8.

Anal sheath very short. Lateral line with pores developed on 7 or 8 scales.

Origin of the dorsal half the length of the eye nearer to the caudal than to the snout. Longest dorsal ray 4.7 in the length. Origin of the anal on the vertical from the third or fourth scale behind the dorsal. Anal truncate, the longest ray equal to the length of the base. Caudal shorter than the head, 4 in the length. Ventrals on the vertical from the first dorsal ray, very small, reaching the third or fourth scale in front of the anal. Pectorals normal but small, reaching the third to fifth scale in front of the ventrals.

No humeral spot. Lateral stripe narrow, lead-gray, extending from the humeral region to the triangular caudal spot. Caudal spot narrowed abruptly behind and continued to the tips of the middle caudal rays. Dorsal, anal, ventrals, and pectorals unmarked but somewhat dusky. Scales silvery below the lateral line.

### 3. *HASEMANIA BILINEATA* Ellis.

Plate 31, fig. 3.

*Hasemania bilineata* ELLIS, Ann. Carnegie mus., 1911, 8, p. 150, pl. 1, f. 3.

HABITAT.—Rio Tieté Basin.



*Specimens examined.*

| Catalogue<br>number | Number of<br>specimens | Size<br>in mm. | Locality                 | Collector |
|---------------------|------------------------|----------------|--------------------------|-----------|
| 3001 C. Type        | 1                      | 41             | Alto da Serra, São Paulo | Haseman   |
| 2938 C. Paratypes   | 4                      | 20-38          | Mogy das Cruzes          | Haseman   |
| 2939 C. Paratypes   | 4                      | 14-16          |                          |           |

Head 3.5; depth 2.8 to 3; D. 11; A. 14 to 17; scales 5-33 or 34-4; eye 2.5 to 3 in the head; interorbital equal to the eye.

Compressed. Depth of head at the base of the occipital process 1.33 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded, with a regular series of about 11 scales.

Occipital process short, 6 or more in the distance from its base to the dorsal. Interorbital almost flat. Frontal fontanel truncate, not so wide as the parietal, three fourths as long as the parietal without the occipital groove. Second suborbital with narrow naked margin behind and below. Maxillary less than the eye, 3.6 in the head. Mandible equal to the eye. Premaxillary with four 7-pointed teeth in the inner row and one conical or tricuspid tooth representing the outer series. Maxillary without teeth. Dentary with three broad, chisel-shaped teeth with 8 or 9 points.

Gill-rakers 8 + 11.

Anal sheath very short or lacking. Lateral line with pores on the first 3 to 6 scales.

Scales cycloid. Probably no interpolated scales or rows of scales.

Origin of the dorsal equidistant from the snout and caudal, the longest ray 3.8 in the length. Origin of the anal on the vertical from the last dorsal ray. Anal rounded, the longest ray equal to the base. Ventrals on the vertical from the third or fourth scale in front of the dorsal. Ventrals reaching to the third or fourth scale in front of the anal. Pectorals, (of fishes over 16 mm.) normal in form and reaching the fourth or fifth scale in front of the ventrals; pectorals of specimens of less than 16 mm., archaic. Adipose lacking.

No true humeral or caudal spots. A heavy black lateral stripe from the caudal peduncle to the head, much fainter over the region of the body-cavity. An almost straight black line from the caudal along the under side of the caudal peduncle to a point just above the origin of the anal. Last four scales of the back black. Fins all unmarked. Scales above the lateral stripe heavily outlined with dusky.



## 12. HOLLANDICHTHYS Eigenmann.

To William Jacob Holland.

*Hollandichthys* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 432.TYPE.—*Tetragonopterus multifasciatus* Eigenmann & Norris.Very similar to *Pseudochalceus*.

Maxillary long, slender, slipping under the preorbital for nearly its entire length, its upper anterior margin concave; premaxillary-maxillary border continuously curved and oblique; middle teeth of the premaxillary scarcely enlarged; dentary with four or five large equal teeth in front; maxillary with teeth along nearly its entire border; scales of sides deep, emarginate; lateral line incomplete.

HABITAT.—Southeastern Brazil.

This genus differs from *Pseudochalceus* in the teeth of the dentary, the scales, etc.

HOLLANDICHTHYS MULTIFASCIATUS (Eigenmann and Norris).

Plate 2, fig. 4; Plate 64, fig. 1, 2, 4; Plate 95, fig. 8.

*Tetragonopterus multifasciatus* EIGENMANN & NORRIS, Revista Mus. Paulista, 1900, **4**, p. 358 (Cubatão).*Pseudochalceus affinis* STEINDACHNER, Anz. K. akad. wiss. Wien, 1908, no. 5, p. 29. (Rio Jaragua near Joinville).*Pseudochalceus perstriatus* RIBEIRO, Kosmos, 1908, no. 1 (Corregos de Iporanga, Santa Catharina).*Hollandichthys multifasciatus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 432.

HABITAT.—São Paulo and Santa Catharina, southeastern Brazil.

*Specimens examined.*

| Catalogue number | Number of specimens | Size in mm.        | Locality                | Collector   |
|------------------|---------------------|--------------------|-------------------------|-------------|
| 9288 I. Cotypes  | 3                   | 34-70 <sup>1</sup> | Cubatão                 | Von Ihering |
| 2951 C.          | 2                   | 40, 106            | Iporanga                | Haseman     |
| 2952 C.          | 18                  | 49-107             | Raiz da Serra, Rio Mogy | Haseman     |

Head 3.5; depth 2.66; D. 11; A. 28-31; lateral line 40; transverse 12; scales 6.5-40-3; 7-9 scales perforated; eye 3.25 in the head; interorbital 2.8.

Compressed, subrhomboidal. Preventral area rounded. Predorsal area rounded, with two somewhat irregularly placed series of scales, much smaller than the scales of the sides.

<sup>1</sup> To base of caudal.



Occipital process about 6 in the distance from its base to the dorsal, bordered by 3 or 4 scales on the side. Interorbital convex. Frontal fontanel half as long as the parietal and occipital process. Head pointed, its upper and lower profiles about equally divergent from the mouth. Second suborbital short and deep, leaving a narrow naked margin behind and a broader one below. Mouth large, terminal. Maxillary extending to the end of the preorbital, 2.5 in the head. Maxillary-premaxillary border without a distinct angle. Three small tricuspid teeth in the outer series of the premaxillary; five narrow tricuspid teeth in the second row, the middle one the longest, graduated slightly to the last, which is about twice as large as the largest maxillary tooth. Maxillary teeth tricuspid, close set at the upper part of the maxillary, more widely spaced toward the lower end. Dentary with four or five tricuspid teeth of about uniform size, the sides with about 10 abruptly minute teeth.

Gill-rakers about 8 + 12.

Scales cycloid, with many parallel striae, those below the lateral line with short and deep exposed surfaces and emarginate edge, regularly imbricate except in front of the dorsal; scales of the preventral and predorsal areas small, a narrow sheath of a single series of scales along the base of the anal.

Origin of dorsal equidistant from snout and base of middle caudal rays. Origin of anal under middle of dorsal. Origin of ventrals more than an orbital diameter nearer snout than to the dorsal; ventrals reaching anal.

Color of back dark, of sides much lighter, with a series of 8 or 9 dark brown longitudinal lateral bands (between the rows of scales). A small, deep, brown spot on each scale of lower half of body. Basal half of adipose fin in adult black. Two vertical humeral spots, of which the posterior on the 6th, 7th, or 8th rows of scales is darkest; both indistinct in adult.

### 13. PSEUDOCALCEUS Kner.

*ψευδής* false, Chalceus, a genus of characins, from χαλκεος, ἥ, copper.

*Pseudochalceus* KNER, Sitzungsab. Akad. wiss. München, 1863, p. 225.

TYPE.—*Pseudochalceus lineatus* Kner.

Mouth large; premaxillary with two series of teeth, those of the outer series much smaller than those of the inner, the middle pair of the inner series much larger than the rest, each tooth with a large median cusp and a small lateral cusp on each side; maxillary with a single series of similar teeth along nearly its entire length. Mandible with a single series of irregularly graduated



teeth, the front four or five on each side being much larger than any of those of the upper jaw, the fourth tooth from in front being usually, though not always, somewhat the largest. Dorsal behind ventrals. Lateral line interrupted. Species with numerous longitudinal stripes.

Very similar to *Hollandichthys*.

HABITAT.—Western Ecuador.

PSEUDOCALCEUS LINEATUS Kner.

Plate 64, figs. <sup>4</sup>3 and 5.

*Pseudochalceus lineatus* KNER, Sitzungs. Akad. wiss. München, 1863, p. 225; KNER & STEINDACHNER, Abhandl. Bayer. akad. wiss., 1864, 10, p. 35, pl. 5, fig. 1 (Western slopes of Ecuador); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432.

This species is known only from the types in the K. K. naturhistorisches Hofmuseum, Vienna, from which the generic description has been drawn. Wagner (Abhandl. Bayer. akad. wiss., 1864, 10, p. 98) states that it occurs only at about 1000 feet elevation.

Head 3.5; depth 2.8–3; D. 10 or 11; A. 25 or 26; scales 36; eye 4 in the head, equal to snout, slightly less than interorbital.

Second suborbital covering nearly the entire cheek; origin of anal below end of dorsal; scales with 12–14 striae; lateral line developed on 6–8 scales; brownish, with darker stripes between rows of scales.

14. ASTYANAX Baird and Girard.

ἄστυ-αναξ, ὁ, lord of the city. In Homer Astyanax, son of Hector.

*Tetragonopterus* in part by authors generally.

*Astyanax* BAIRD & GIRARD, Proc. Acad. nat. sci. Phil., 1854, 7, p. 26; U. S. & Mex. bound. surv., 1859, p. 74; EIGENMANN, Ann. Carnegie mus., 1907, 4, p. 127 (*argentatus*).

*Poecilurichthys* GILL, Ann. Lyc. nat. hist. N. Y., 1858, 6, p. 54 (*brevoortii*).<sup>1</sup>

*Zygogaster* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 23 (*filiferus*).<sup>2</sup>

TYPE.—*Astyanax argentatus* Baird & Girard.

Small, compressed fishes, more or less elongate, rarely reaching a length of 150 mm., usually much smaller, but in one instance, *A. maximus*, reaching 200 mm. in length.

Premaxillary with two series of teeth, the first series with several teeth;

<sup>1</sup> ποικιλία, variegated, οὐρα, tail, ἰχθύς, ὁ, fish.

<sup>2</sup> ζυγόν, τό, a yoke, γαστήρ, ἡ, the belly.



mandible with strong teeth in front, abruptly minute conical ones on the sides or more gradually very small ones on the sides, without conical teeth in a second series; teeth of second series of premaxillary equal or graduated, usually five in number, four in a few species; crowns of premaxillary and mandibular teeth usually ridged and denticulate; maxillary with a few or no (0-10) teeth; caudal naked; lateral line complete; gill-rakers setiform; no predorsal spine. Form usually slender, depth more than two in the length, except in *A. bimaculatus*, *A. lacustris*, and *A. alleni*.

There is considerable difference in the character of the teeth of the second row of the premaxillary. In some of the larger species the back of each tooth of the inner series is convex, the front hollowed, spoon-fashion, and the curved free margin is serrate, the median point strongest; the teeth of the lower jaw are the reverse of this and since the two series of teeth alternate with each other they form a zigzag cutting edge as the jaws are closed. The lower teeth pass behind the upper ones. In some species, probably in all the smaller species, the hollow of the teeth is sometimes reduced so that the teeth become simple, serrate incisors.

As here understood *Astyanax* is stripped of the forms having a scaled caudal, an incomplete lateral line, a combination of four teeth in the inner row of the premaxillary with a completely armed suborbital, and of those with the entire or nearly entire edge of the maxillary denticulate, all of which have until recently been associated with it under *Tetragonopterus*. It is divisible into a group without a complete series of scales between the dorsal and the occipital process which includes most of the deep-bodied, smaller scaled species (*Poecilurichthys*) and into a group of slenderer, sometimes minute, usually larger scaled species with a regular and complete series of scales between the occipital process and the dorsal (*Astyanax*).

*Astyanax* is one of the dominant genera of South America. At present it is found from Patagonia to the United States (New Mexico) and from tide-water to high up in the mountains. It is found on both slopes of the Cordilleras from Ecuador to Mexico. Two species are more conspicuous than the others on account of their wide distribution, *A. bimaculatus* from La Plata to Panama, and *A. fasciatus* from the Rio Negro, Patagonia to Mexico.

*Astyanax bimaculatus* is represented by more or less distinct varieties in different localities. Of special interest in the same respect is *A. fasciatus*. This species, so widely distributed, is absent from the Parahyba where it is replaced by a distinct species; it is also absent from other rivers where it has probably



also taken on forms considered specifically distinct; this species admirably shows the divergence of species with isolation in the rivers independently emptying into the Atlantic in eastern and southeastern Brazil and in Central America and Mexico. In the latter area it has given rise to a series of species or varieties, *A. mexicanus*, *A. macrophthalmus*, and *A. nicaraguensis*, distinguishable from each other but scarcely distinguishable from the independently originated varieties and species of southeastern Brazil.

In many cases the varieties are statistical, *i. e.*, while specimens of the two varieties cannot be distinguished, a large number of specimens from one locality are in the aggregate different from a large number of other specimens from another locality. The details are given under the respective species.

The genus shades in many directions into genera here treated as distinct.

There is considerable variation in the size of the mouth, from the small mouthed *A. alleni*, *A. pellegrini*, *A. festae*, etc. to *A. fasciatus*, *A. scabriceps*, and others that lead to the genus *Astyanacinus*. Similarly there is an irregular variation in the number of teeth in the maxillary from none to three or four or even ten. Of special interest is the variety *A. nicaraguensis*, in which the dentition of the maxillary shows a complete gradation from typical *Astyanax* to the species segregated as *Hemibrycon*. The caudal sheath is always small but here also in *A. taeniatus intermedius* there is an indication of a tendency toward *Moenkhausia*. In all the specimens of the species of *Astyanax* examined except *A. mutator* the lateral line was complete; in specimens of *Hemigrammus inconstans* the lateral line is complete in some and in others it is incomplete. On the other hand, of the hundreds of specimens of many other species of *Hemigrammus*, but one or two were found with a complete lateral line. The details are given under the respective species. In *A. festae*, *A. regani*, *A. albeolus*, some specimens of *A. metae*, and half the specimens of *A. rivularis* from the Rio San Francisco there were but four teeth in the inner series of the premaxillary, one of the characters distinguishing *Bryconamericus*. In *A. goyacensis*, *A. multidentis*, *A. gracilior*, and *A. paucidentis*, we have the entire cheek covered with the second suborbital, one of the other characters distinguishing *Bryconamericus*. In *A. taeniatus* the teeth of the sides of the lower jaw tend to become graduate, a condition leading to the distinguishing character of *Deuterodon*. In *A. alleni* the scales are ciliated and lead toward *Ctenobrycon*. The genus is thus seen to branch out in various directions, the ends of the branches being here considered as distinct genera.



*Key to the Species.*

Subgenera: Poecilurichthys and Zygogaster.

- a. Lateral line 40-55, sometimes 38 in *abramis*.
- b. Anal rays 40-45; mouth very small; rows of scales below the lateral line, deflected toward anal; caudal spot not continued to end of caudal. (La Plata Basin).
- c. Lateral line 48-55.
  - d. Depth 2.63; A. 45; lateral line 55; eye .66 in snout, .8-.83 in interorbital.
    - 1. *erythropterus* (Holmberg).
  - dd. Depth 2-2.2; A. 40-45; lateral line 48-50; eye 1-1.1 in interorbital, 2.75 in head; interpolated rows of scales beginning above origin of ventrals.
    - 2. *alleni* (Eigenmann & McAtce).
- cc. Lateral line 42-50.
  - e. Depth 2.5-2.8; A. 41; scales 9 to 11-45 to 50-8; eye 1 in interorbital, 2.5-2.75 in head; interpolated scales above anal only.....3. *pellegrini* Eigenmann & Kennedy.
  - ee. Depth 2.5; A. 45; scales 8-42-7 or 8; eye 1.7 in interorbital, 3.7 in head.
    - 4. *correntinus* (Holmberg).
- bb. Anal rays 34-43. (Ecuadorian species).
  - f. Maxillary without teeth, about half as long as eye; two conspicuous humeral spots; no caudal band, the spot variable. Depth 2.5-3; A. 33-40; scales 8-41 to 47-8; eye 2.75 in head, equals interorbital in largest.....5. *festae* (Boulenger).
  - ff. Maxillary with two teeth, about half as long as snout and eye; a distinct humeral spot; depth 3; A. 41; scales 8-46-8; eye 2.5 in head.....6. *riveti* Pellegrin.
- bbb. Anal rays 22-34; mouth large; maxillary about equal to the eye.
  - g. No humeral spot; very few short auxiliary rows of scales above the anal; 2-4 striae on the scales above the lateral line; depth 2 7/11-3.3. (Upper Amazon).
  - h. Scales 11 or 12-54 or 55-9 or 10; A. 28-32; depth 3-3.33; a black spot on the base of the middle caudal rays, continued to the lower margin of the fin and to near the tips of the middle rays.....7. *asymmetricus* Eigenmann.
  - hh. Scales 8-48-6; A. 30; depth 2 7/11; a caudal spot continued on the middle caudal rays.....8. *symmetricus* Eigenmann.
  - gg. A round humeral spot over the 7th-9th scales of the lateral line; depth 2-2.5; A. 27-31; lateral line 42-46; interorbital very convex. (Guiana).....9. *polylepis* (Günther).
  - ggg. A faint vertical humeral spot over the 3d scale of the lateral line. Depth 2.7-3.; scales 8 or 9-42 to 47-5 or 6; A. 27-30; eye 2.56; 2-11 striae on the scales above the lateral line; a black or dark bar across the base of the caudal, continued on the middle caudal rays.....10. *zonatus* Eigenmann.
  - gggg. A well-defined horizontally or vertically oval humeral spot.
    - i. Caudal spot not continued to the end of the rays; no spot on caudal peduncle; silvery band narrow and faint.
      - j. Scales 12-53-9; A. 34; humeral spot horizontally ovate over and in part on the first five scales of the lateral line; caudal spot small, well defined; lower fins blackish.....11. *bourgeti* Eigenmann.
      - jj. Scales 9 to 11-43 to 51-7; A. 28-30; humeral spot narrowly ovate, horizontal, over the first five scales of the lateral line, caudal spot large diffuse.
        - 12. *abramoides* Eigenmann.
    - ii. Caudal spot continued to the end of the middle rays.
      - k. Depth 2.8; humeral spot sublinear, over the origin of the lateral line; scales 10-52 or 53-6; A. 28-32; scales not deflected toward the anal.
        - 13. *anterior* Eigenmann.
      - kk. Depth 2-2.3; humeral spot oval; a broad spot on caudal peduncle, tapering forward; scales 7 to 10-38 to 49-6 or 7; A. 30-34.
        - 14. *abramis* (Jenyns).
- aa. Scales 40, or fewer, except rarely 41, in *A. bimaculatus*, *A. caucanus*, and *A. stilbe*.
  - l. A well-defined circular or horizontally oval humeral spot; A. 21-41; scales 31-41. *peruvianus* Eigenmann.
  - m. Depth less than 3 in the length.



- n.* Humeral spot horizontally ovate; anal rays less than 36 in all but *A. borealis*.
- o.* Denticles of each tooth of the inner series of the premaxillary arranged in a crescent or U-shaped line.
- p.* Depth 1.9–2.5; some interpolated series of scales over the anal muscles; pectorals reaching slightly beyond origin of ventrals.
- q.* Scales 34–41.
- r.* Anal rays 26–39; scales 39–40.
16. *bimaculatus borealis* Eigenmann.
- rr.* Anal rays 26–36 (most frequently 30 or 31).
- s.* No series of lateral spots. . . . . 15. *bimaculatus* (Linné).
- t.* Series of spots along rows of scales.
17. *bimaculatus paraguayensis* Eigenmann.
- qq.* Scales 32–36; A. 21–38; depth in the adult 1.9–2.2.
- u.* Series of spots along the rows of scales.
18. *bimaculatus vittatus* (Castelnau).
- uu.* Lateral band silvery; no spots along rows of scales.
19. *bimaculatus lacustris* (Lütken).
- uuu.* Lateral band black; no spots along rows of scales.
20. *bimaculatus novae* Eigenmann.
- pp.* Depth 2.7–2.83; pectorals not reaching ventrals; no interpolated series of scales; base of anal equal to distance between the dorsals.
- v.* Check with  $\frac{1}{3}$  of its width naked; two maxillary teeth; snout pointed; predorsal area entirely scaled, with an almost complete series of median scales; scales above the anal with rarely more than 2 striae. . . . . 21. *janeiroensis* Eigenmann.
- vv.* Check entirely covered by the second suborbital; one maxillary tooth; snout blunt, rounded; scales above the anal with four or more striae.
22. *goyacensis* Eigenmann.
- oo.* Teeth of the inner series of the premaxillary alike in front and behind, the denticles arranged in a nearly straight line;
- w.* Scales 7–37 to 41–6; maxillary with one to three teeth, extending to below origin of pupil; depth 2.4; head 4; eye a little more than 3 in head. A. 30–33. . . . . 23. *orthodus* Eigenmann.
- ww.* Scales 8 (rarely 9)–37 to 39 (rarely 41)–6 or 7. A. 27 or 28, rarely 29. Humeral spot blended with a vertical band.
24. *potaroensis* Eigenmann.
- nn.* Humeral spot very conspicuous, circular or vertically elongate, pre-ventral area compressed, with a series of very small median scales, the scales bordering them with the lower (median) margin truncate, or two or three series of small scales; series of scales below the lateral line decurrent. . . . . (ZYGOGASTER).
- x.* Second suborbital not in contact with the preopercle below.
- y.* Anal rays 36–41. A silvery lateral band. Dorsal a little behind the origin of the ventrals; the anterior anal rays elongate. Maxillary extending to near the anterior margin of the eye. Depth 2.4–2.8; head 3.5; scales 8–37 to 40–10.
25. *stilbe* (Cope).
- yy.* Anal rays 33 or 34; depth 2.33.
26. *magdalenae* Eigenmann and Henn.
- xx.* Second suborbital in contact with the opercle below.



z. Dorsal and ventrals in the male not filamentous; origin of the anal in the male nearer the base of the last anal ray than to the origin of the dorsal; anal rays 37-42;

A. Depth 1.9-2.2.....27. *atratoensis* Eigenmann.

AA. Depth 2.33-3.....28. *caucanus* (Steindachner).

zz. First dorsal and outer ventral rays filiform in the male; origin of anal nearer origin of dorsal than base of last anal ray in the male; depth in the male 3, in the female 2.5; A. 38 or 39; lateral line 38 or 39.

29. *filiferus* (Eigenmann).

### 1. ASTYANAX (POECILURICHTHYS) ERYTHROPTERUS (Holmberg).

*Tetragonopterus erythropterus* HOLMBERG, Revista Arg. nat. hist., 1891, **1**, p. 189 (Paraná; Buenos Aires).

*Astyanax erythropterus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 432.

HABITAT.—Paraná; Buenos Aires.

Known only from the types.

Head 3.6; depth 2.63; D. 11; A. 45; scales 12-55-11; eye .66 in snout, .8-.83 in interorbital.

Profile concave over posterior part of eye, rising in a curve to the dorsal; ventral profile a curve to origin of anal, rising obliquely along entire base of anal.

"Blanco plateado, por arriba un poco amarillento y algo verdoso, salpicado de fina y diminuta irroracion negra que se sigue las oblicuidades de las líneas intermusculares; tales puntos se hallan mas esparcidos en los radios. Ojo auricálico; aletas pares claras, impares de un rojo vivisimo, casi vermellon." Holmberg.

### 2. ASTYANAX (POECILURICHTHYS) ALLENI (Eigenmann and McAtee).

Plate 32, fig. 3.

*Tetragonopterus alleni* EIGENMANN & McATEE, Ann. Carnegie mus., 1907, **4**, p. 127, pl. 40, fig. 2 (Corumbá; Rio Otuquis; Asuncion).

*Ctenobrycon alleni* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 435.

HABITAT.—Paraguay Basin.

#### *Specimens examined.*

| Catalogue number | Number of specimens | Size in mm.                       | Locality    | Collector |
|------------------|---------------------|-----------------------------------|-------------|-----------|
| 10158 I. Type    | 1                   | 93 <sup>1</sup>                   | Corumbá     | Anisits   |
| 10159 I.         | 1 ♀                 | 71 <sup>1</sup>                   | Corumbá     | Anisits   |
| 10160 I.         | 1                   | 74 <sup>1</sup>                   | Rio Otuquis | Anisits   |
| 10161 I.         | 2 ♂                 | 58 <sup>1</sup> , 73 <sup>1</sup> | Asuncion    | Anisits   |

<sup>1</sup> To base of caudal.



Most closely related to *Ctenobrycon hauxwellianus*, but with a naked predorsal line, the young more slender, the scales on the sides below the lateral line less regularly arranged. This species is evidently the southern modification of *C. hauxwellianus*.

Head about 4; depth 2-2.2; D. 11; A. 40-45; scales 11-48 to 50-8; eye 2.75; interorbital 2.5, in the largest 2.75.

Compressed, elongate; ventral profile from snout to end of anal, a nearly regular arc of a circle with a diameter of a little more than half the length; dorsal profile equally arched but the outline less regular, being, with age, increasingly humped in the nape. Preventral area rounded, without a median series of scales; postventral area bluntly keeled. Predorsal area bluntly keeled, with a double series of half scales which do not meet over the back; 7-9 scales along either side of the occipital process.

Occipital process about one third of the distance from its base to the dorsal. Frontal fontanel more than half the length of the parietal which is continued as a groove to the tip of the occipital process. Interorbital convex. Second suborbital leaving a naked area of equal width around its entire free margin. Mouth minute, the maxillary very convex in front, nearly vertical, its length equals that of snout in medium sized specimens, less than snout in the largest, 4-5 in the head; four or five teeth in the front row of the premaxillary, five in the second row; a single, broad tooth on the maxillary.

Gill-rakers 10 + 17, the longest not equal to one third the length of the eye.

Scales ciliate in the adult, entire in the young, with numerous radiating striae, regularly imbricate but irregular in size above the lateral line. Lateral line nearly straight, the row of scales below it dicotomously branched above the origin of the ventrals, the main row being apparently deflected; other rows similarly branched. The rows of scales above the front of the anal are all oblique; from above the second third of the anal, there are two or three series of scales parallel with the lateral line; scales becoming smaller backward; the ventrals and origin of anal, being equally removed from the lateral line, have respectively 9 and 14 rows of scales or 8 and 13. Anal sheath continued with the scales of the sides, of three rows of scales. Caudal naked; a large axillary scale.

Origin of dorsal equidistant from tip of snout and base of caudal or a little nearer the latter; dorsal pointed, its rays rapidly and regularly graduate, the highest three in the length, the penultimate not much more than one third the length of the highest. Origin of anal and base of last or middle dorsal ray equidistant from snout, its margin nearly straight; fifth to seventh scale in front of dorsal and ventrals equidistant from tip of snout, reaching to anal in young



but falling short in the adult; pectorals reaching beyond origin of ventrals but not to tip of axillary scale.

A narrow, silvery lateral band, an obscure vertical humeral spot and a similar caudal spot.

Vertebrae 11 + 22.

Second air-bladder oblique conical, tapering abruptly into a vermiform appendage, its entire length not twice that of the anterior air-bladder, its diameter rather greater than the diameter of the eye, one half of its length exclusive of the appendage. Alimentary canal about equal to the entire length, filled with bivalves in the one dissected.

The humping of the nape in this species as well as in *A. hauxwellianus*, is caused in part by the development of a large adipose body in the space between the occipital crest and the musculature of the dorsal fin. The specimens were first preserved in formalin and it may be that the feeble denticulation of the scales is due to the action of the preservative and that this species is congeneric with *A. hauxwellianus*.

### 3. ASTYANAX (POECILURICHTHYS) PELLEGRINI (Eigenmann and Kennedy).

Plate 40, fig. 5.

*Poecilurichthys multiradiatus* EIGENMANN & KENNEDY, (non *Tetragonopterus multiradiatus* Steind.), Proc. Acad. nat. sci. Phil., 1903, p. 521 (Asuncion).

*Astyanax multiradiatus* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, **33**, p. 29 (Paraguay).

*Astyanax pellegrini* EIGENMANN & KENNEDY, Ann. Carnegie mus., 1907, **4**, p. 136, pl. 40, fig. 3 (Bahia Negra); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 432.

HABITAT.—Paraguay Basin.

#### *Specimens examined.*

| Catalogue number           | Number of specimens | Size in mm.        | Locality    | Collector |
|----------------------------|---------------------|--------------------|-------------|-----------|
| 10246 I. Type <sup>1</sup> | 1 ♂                 | 68 <sup>3</sup>    | Bahia Negra | Anisits   |
| 10245 I. <sup>1</sup>      | 1 ♀                 | 77 <sup>3</sup>    | Bahia Negra | Anisits   |
| 10011 I. <sup>1</sup>      | 1                   | 29–67 <sup>3</sup> | Asuncion    | Anisits   |
| 10013 I. <sup>1</sup>      | 1                   |                    |             |           |
| 10014 I. <sup>1</sup>      | 2                   |                    |             |           |
| 10017 I. <sup>1</sup>      | 1                   |                    |             |           |
| 10053 I.                   | 1                   |                    |             |           |
| 3322 C. <sup>2</sup>       | 12                  |                    | Asuncion    | Haseman   |
| 3323 C.                    | 8                   |                    | Villa Hays  | Haseman   |
| 3340 C.                    | 7                   | 57–80              | Corumba     | Haseman   |
| 3341 C. <sup>2</sup>       | 12                  | 28–74              | Corumba     | Haseman   |

<sup>1</sup> Anal rays. . . . . 42      40      40      42      42      42

<sup>2</sup> Depth in the length. . . . . 2.2      2.3      2.4      2.25      2.6      2.2

<sup>3</sup> To base of caudal.



Allied to *A. alleni*, much slenderer and the scales of the lower sides regularly imbricate except over the muscles of the anal.

Head 4.25; depth 2.5 in 10,245 (female);  $2\frac{5}{8}$  in 10,246 (male); D. 11; A. 41-45; scales 9 to 11-45 to 50-8; eye 2.5-2.75, interorbital equals eye.

Elongate compressed, the dorsal and ventral profiles equally arched in the male, without humps or depressions; in the female the ventral profile is deeper than the dorsal, and regular, the dorsal profile somewhat humped at the occiput. Preventral area narrowly rounded, without a regular median series of scales; postventral area narrowly compressed. Predorsal area keeled, naked except just in front of the dorsal where the scales of one side sometimes have a narrow margin bent over the back; about six scales bordering the occipital process on the side.

Occipital process 3 to 4 in the distance from its base to the dorsal, being longer in the deep specimens; occipital fontanel nearly twice as long as the frontal and continued as a groove to the tip of the occipital process. Interorbital convex. Second suborbital, as in *A. alleni*, leaving a narrow naked area around its free margin. Mouth small, anterior margin of maxillary much arched, its upper part vertical, equal to the snout or shorter, 4.2-4.5 in the head. Mandible 2.75 in head. Five teeth in the outer series of the premaxillary, the third removed from the line; five teeth in the inner series, the points of the middle ones, at least arranged in a U-shaped series. Four graduated asymmetrical teeth and a number of small ones on the dentary. Maxillary with a single tooth.

Gill-rakers 10+16, longest equal to about one third the diameter of the eye.

Scales very feebly ciliate, rather irregularly imbricate, there being small and large scales, rows regular without interpolated series except over the anal musculature. Lateral line but little decurved, the row of scales below it parallel with it; a variable axillary scale. Caudal naked. Anal with a low sheath of two or three series of scales.

Origin of dorsal usually a little nearer snout than base of caudal; dorsal pointed, its height 3-3.33, in the length. Origin of anal and base of middle dorsal ray equidistant from tip of snout; anterior anal rays higher but the margin nearly straight. Ventrals reaching anal. Pectorals considerably beyond origin of ventrals; origin of ventrals and 7th scale in front of the dorsal about equidistant from tip of snout.

A silvery, lateral band, narrowed on the caudal peduncle and interrupted in front by a vertical humeral spot; humeral spot bordered in front and behind by a pigmentless area, that behind bordered on its part by a faint second humeral



spot; an obscure spot on end of caudal peduncle, not continued to the end of the middle rays and not evident in alcoholic specimens; humeral spot faint in alcoholic specimens.

Vertebrae 12+22.

Second air-bladder much curved, ending in a point,  $1\frac{2}{3}$  times as long as the anterior, its greatest vertical diameter nearly one half the length of the head. Alimentary canal equal to the entire length, containing in part plant-filaments.

It is possible that *A. (Tetragonopterus) correntinus* and *A. erythropterus* Holmberg are related to this species though it is impossible to say from the brief description.

#### 4. ASTYANAX (POECILURICHTHYS) CORRENTINUS (Holmberg).

*Tetragonopterus correntinus* HOLMBERG, Revista Arg. nat. hist. 1891, **1**, p. 188 (Corrientes, Rio Paraná).  
*Astyanax correntinus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 432.

HABITAT.—Paraná.

Known only from the types. It is possible that it is *A. pellegrini*.

The following is the original description of this species:—

D. 11; A. 45; V. 8; L. lat. 42; L. tr 8/7-8; depth 2.5; head 3.7; eye 3.7; interorbital 2.6.

|                               |     |     |
|-------------------------------|-----|-----|
| Long. (sin caudal).....       | 90  | mm. |
| Altura.....                   | 36  | mm. |
| Ancho.....                    | 11  | mm. |
| Long. de la cabeza.....       | 24  | mm. |
| Diametro ocular.....          | 6.5 | mm. |
| Hocico.....                   | 5   | mm. |
| Distancia interorbitaria..... | 11  | mm. |

Lanceolado: el perfil superior se deprime en línea cóncava sobre el ojo y luego sube en curva hasta la aleta dorsal, decliva luego en la base de esta y entónces corre hácia la caudal con una lijere convexidad; el perfil inferior es una curva continua que termina en el ápice de la anal. El ápice de los radios ventrals queda debajo del nacimiento de la dorsal. La altura es mayor que el tercio del largo (sin caudal). Plateado, en lo superior un poco oscuro por irroracion parda muy fina. Aletas claras, la dorsal un poco oscura; pectoral pardusca en su mitad superior; una mancha parda en la base de la caudal.

Patria: Republica Argentina, Corrientes. Rio Paraná. Descubierto por Solari en IV, 1885. Holmberg.

#### 5. ASTYANAX (POECILURICHTHYS) FESTAE (Boulenger).

Plate 40, fig. 4. Plate 95, fig. 5.

*Tetragonopterus festae* BOULENGER, Boll. Mus. univ. Torino, 1898, **13** (Rio Vines); STARKS, Proc.

U. S. N. M., 1906, **30**, p. 776 (Mirador, Ecuador).

*Astyanax festae* EIGENMANN, Rept. Princeton univ. Exped. Patagonia, 1910, **3**, p. 432.

HABITAT.—Western Ecuador.



*Specimens examined.*

| Catalogue number  | Number of specimens | Size in mm.     | Locality                 | Collector |
|-------------------|---------------------|-----------------|--------------------------|-----------|
| 5429 C.           | Many                |                 | Vinces                   | Henn      |
| 5430 C.           | Many                | 76 <sup>1</sup> | Colimes, Rio Daule       | Henn      |
| 5431 C.           | Many                | 71 <sup>1</sup> | Puertoviejo              | Henn      |
| 5432 C.           | 1                   | 78              | Rio Chan Chan, Naranjito | Henn      |
| 9587 <sup>2</sup> | 10                  | 39-64           | Mirador                  | Simons    |
| 13117 I.          | Many                |                 | Vinces                   | Henn      |
| 13118 I.          | Many                |                 | Colimes, Rio Daule       | Henn      |
| 13119 I.          | Many                |                 | Puertoviejo              | Henn      |
| 13120 I.          | 1                   | 78              | Rio Chan Chan, Naranjito | Henn      |
| 13580 I.          | 1                   | 51              | Chone, Prov. Manabi      | Henn      |

Head about 4; depth about 2.5; D. 11; A. 33-40; scales 8-41 to 48-7 or 8; eye 2.75-3 in the head, equal to the interorbital in the largest; less than interorbital in the smaller.

Compressed, subrhomboidal, elongate; head bluntly subconical. Pre-ventral area narrowly rounded, the median series of scales not quite regular; postventral area narrowly keeled. Predorsal area bluntly keeled; the median line largely naked in the adult, about 17-20 scales between the dorsal and occipital process along one side of the median line.

Occipital process about one fifth of the distance from its base to the dorsal, bordered by about 5 scales; profile slightly depressed. Interorbital rounded. Frontal fontanel two thirds the length of the parietal without the occipital groove. Second suborbital leaving one fourth or less than one fourth the width of the cheeks naked. Mouth very small. Maxillary not much more than half the length of the eye, nearly vertical, not reaching the eye. Mandible equals the eye in length; three to five teeth in the outer row of the premaxillary, four very broad teeth in the inner row, their denticles arranged in distinct crescents. No maxillary teeth. Dentary with four larger graduate teeth (those of the two dentaries arranged in a distinct crescent) and one or two smaller ones scarcely evident; no teeth in side of lower jaw, the dentiferous ridge raised, scale-like at its end.

Gill-rakers 10 + 12, about equal to posterior nostril.

Dorsal a little nearer caudal than tip of snout, obliquely truncate, its longest ray 4 in the length. Origin of anal under middle of dorsal, its border but little emarginate. Ventrals scarcely reaching anal, their origin under the

<sup>1</sup> Largest specimen.

<sup>2</sup> Leland Stanford Jr. University Collection.



9th scale in front of the dorsal, equidistant from tip of snout and the origin of the last third of the anal. Pectorals reaching about to end of the well-developed axillary scale.

Lateral line nearly straight; scales with but few widely diverging striae, regularly imbricate except over the anal where a few interpolated rows cause the regular rows to be deflected toward the anal.

Anal sheath of a single series of scales.

Dusky above, silvery below; two well-marked vertical humeral spots over the fourth and fifth and over the tenth and twelfth scales of the lateral line, the second spot usually the larger; a silvery lateral band which ends in a dark caudal spot which becomes diffuse on the caudal, never a median caudal band.

#### 6. *ASTYANAX* (*POECILURICHTHYS*) *RIVETI* Pellegrin.

Plate 40, fig. 3.

*Astyanax riveti* PELLEGRIN, Bull. Mus. hist. nat., 1907, **13**, p. 25 (Rio Pove); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 432.

*Tetragonopterus (Astyanax) riveti* PELLEGRIN, Mission Equateur, 1912, **9**, B. 7, pl. 1, fig. 1.

HABITAT.— West slope of the high Andes of Ecuador.

TYPE, a specimen 80 mm. in the Mus. his. nat. Paris. Rio Pove, Santo Domingo de los Colorados, Ecuador, 560 meters d'altitude. Rivet.

The account in the key is drawn from the type which I was able to examine through the courtesy of Dr. Pellegrin. In the shape of the mouth this species approaches *A. asymmetricus*, *A. symmetricus*, *et al.*

It is very probable that this is a synonym of *Bryconamericus brevirostris* (Günther).

#### 7. *ASTYANAX* (*POECILURICHTHYS*) *ASYMMETRICUS* Eigenmann.

Plate 41, fig. 2.

*Astyanax asymmetricus* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 94; Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 432.

HABITAT.— Tabatinga.

#### *Specimens examined.*

| Catalogue number | Number of specimens | Size in mm.  | Locality  | Collector |
|------------------|---------------------|--------------|-----------|-----------|
| 20766 Type       | 1                   | 51           | Tabatinga | Bourget   |
| 20763            | 2                   | 40, 45 about | Tabatinga | Bourget   |



Distinguishable from all other members of the genus by the triangular, asymmetrically placed caudal spot.

Head 3.3-3.7; depth 3-3.3; D. 11; A. 30, 32, 28; scales 11 or 12-54 or 55-9; eye 2.5-2.75 in the head; interorbital 3.1-3.75.

Compressed, symmetrically elliptical to the slender caudal peduncle. Pre-ventral area flattened, with a distinct median series of scales for at least part of the length; postventral area compressed to an edge. Predorsal area compressed, without a median series of scales, the scales of the sides not bent over the ridge, which is naked.

Occipital process about one fourth the distance of its base from the dorsal, bordered by about 6 scales on each side. Frontal fontanel but little shorter than the posterior, exclusive of the groove on the occipital process. Interorbital but little convex. Second suborbital quite or nearly in contact with the vertical limb of the preopercle behind, but leaving a considerable naked area below. Snout long and pointed. Maxillary long and slender, about as long as the eye. Three or four teeth in the front row of the premaxillary, if four the third removed from the line; five teeth in the second series, the denticles arranged in a nearly straight line. Two very minute teeth on the maxillary. Dentary with four slightly graduate teeth and a number of smaller ones. Mandibles half the length of the head.

Gill-rakers slender, a little more than one third diameter of eye, about 8 + 14.

Scales small, cycloid, with numerous concentric lines but few radial striae, everywhere very regularly but not deeply imbricate, of nearly uniform size; caudal naked. Anal sheath composed of a single series of caducous scales. Lateral line little decurved, the row of scales below it parallel with it; no interpolated scales even over the anal muscles; axillary scale well developed.

Origin of dorsal a scarcely perceptible distance nearer tip of snout than base of caudal, pointed, its highest ray about 3.5 in the length. Caudal lobes a little longer than the highest dorsal ray. Anal emarginate, the highest ray about 6 in the length; the 12th ray about half the length of the highest; origin of anal and base of last dorsal ray equidistant from tip of snout. The ventrals reaching anal, scarcely nearer tip of snout than to the base of the first dorsal ray.

All but the tips of the middle caudal rays black, the spot continued obliquely downward on the end of the caudal peduncle to its lower edge, otherwise immaculate.



8. *ASTYANAX* (*POECILURICHTHYS*) *SYMMETRICUS* Eigenmann.

Plate 41, fig. 1.

*Astyanax symmetricus* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 95; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432.

One specimen 20768 in part. TYPE. 74 mm. Tabatinga. Bourget.

Allied to *A. asymmetricus*, *A. anterior* and *A. zonatus*. Distinguished by the absence of a humeral spot and the nearly symmetrical caudal spot. Most nearly like *A. zonatus*, from which it differs, among other things, by the striation of its scales.

Head 2.66; depth 2.63; D. 11; A. 30; scales 8-48-6; eye 3; interorbital 2.66.

Symmetrically elliptical to the caudal peduncle, compressed. Preventral area rounded, without a continuous median series of scales; postventral area keeled. Predorsal area narrow, completely scaled, but without a median series of scales.

Occipital process narrow,  $4\frac{3}{4}$  in the distance from its base to the dorsal, bordered by 4 scales on the sides. Frontal fontanel not much shorter than the posterior exclusive of the occipital groove. Second interorbital leaving a naked area which is widest below. Maxillary equal to the eye. Premaxillary with four teeth in the front row, of which the third is slightly withdrawn from the line; five graduated teeth in the second row, their denticles arranged in a crescent; maxillary with a single small tooth; lower jaw with three large, multicuspid graduate teeth and about eight small ones on the side. The first and second of the lateral teeth may be 2-pointed, the rest are retrorse conical, grading from in front back, the first abruptly smaller than the anterior teeth but larger than the following ones.

Gill-rakers 10 + 15, about one third the length of the eye.

Scales cycloid, regularly imbricate, an interpolated row between the second and third or third and fourth series below the lateral line, above the second fourth of the anal. Lateral line but little decurved, the row of scales below it parallel with it, each scale with 2-4 radiating striae; axillary scale well developed.

Origin of dorsal equidistant from tip of snout and base of upper caudal lobe; the fin pointed, its highest ray about 4 in the length. Anal emarginate, its origin and the base of the last dorsal ray equidistant from the snout. Ventrals just



reaching anal, their origin and the third scale in front of the dorsal equidistant from the snout. Pectorals reaching the ventrals.

Brassy; a silvery lateral band; no trace of a humeral spot; middle caudal rays dark, the chromatophores scattered over the base of the neighboring rays.

### 9. *ASTYANAX* (*POECILURICHTHYS*) *POLYLEPIS* (Günther).

Plate 54, figs. 3 and 5.

*Tetragonopterus polylepis* GÜNTHER, Cat. fishes Brit. mus., 1864, 5, p. 320 (British Guiana); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 52; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 276; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432; Mem. Carnegie mus., 1912, 5, p. 356, pl. 41, figs. 2, 3.

HABITAT.—Guiana.

#### *Specimens examined.*

| Catalogue number  | Number of specimens | Size in mm. | Locality                    | Collector |
|-------------------|---------------------|-------------|-----------------------------|-----------|
| 1415 C., 11791 I. | 10                  | 49–85       | Crab Falls, Essequibo River | Eigenmann |
| 1416 C.           | 1                   | 44          | Wismar, Demerara River      | Eigenmann |
| 1417 C., 11790 I. | 10                  | 38–52       | Gluck Island, Rockstone     | Eigenmann |
| 1418 C., 11789 I. | 19                  | 35–53       | Rockstone, Essequibo River  | Eigenmann |
| 1419 C., 11792 I. | 9                   | 50–85       | Tumatumari, Potaro          | Eigenmann |

Readily distinguished by its circular spot over the 7–9 scales of the lateral line and its small scales.

Head 3.5–4; depth 2 in the largest, 2.6 in the young; D. 11; A. 27–31<sup>1</sup>; scales 10–42 to 46<sup>2</sup>–7 to 9 to ventrals; eye 3, interorbital 2.3 in the length of the head.

Much compressed, very deep in adults, the ventral profile pendant, the dorsal regularly arched from the snout to the caudal peduncle; much more slender in the young but maintaining the same ratio of curvature between the back and belly. Preventral region narrowly rounded, the pectorals considerably above the lower edge of the breast, scales of belly irregularly imbricate; postventral area narrowly compressed; entire back very narrow, not especially keeled. Predorsal area naked to near the dorsal where there are a few median scales or a few of the scales of one side lapping over the back.

Occipital process one fourth of the distance from its base to the dorsal,

<sup>1</sup> Günther gives the anal as 34 in the type. In twenty specimens examined two have 27 rays, four have 28; eight have 29, four have 30 and two have 31.

<sup>2</sup> In sixteen six have 42, six have 43, two have 44, one has 45 and one 46.



bordered on the sides by 5 scales; skull smooth, very convex. Frontal fontanel shorter than the parietal, extending to above the anterior margin of the pupil. Margin of second suborbital very convex, leaving but a narrow naked area. Maxillary 2.66 in the head. The mouth large. Four to six teeth in the front row of the premaxillary, the third withdrawn from the line with the rest; five teeth in the second series, their denticles in a straight line; eight large teeth in the lower jaw (four on each side) arranged in a crescent; small teeth on the side.

Scales of the sides and back regularly imbricate, a few interpolated scales over the anal muscles; a row of about 12 scales forming a sheath along the base of the anterior anal rays. Scales of belly and breast not very regularly arranged; lateral line but little decurved; axillary scale well developed.

Dorsal equidistant with the ventrals from the snout, its origin a little in advance of the middle, its highest ray  $3\frac{1}{2}$  in the length. Anal emarginate. Ventrals not reaching anal. Pectorals slightly beyond the origin of ventrals.

Highly iridescent; a round spot over the 7th-9th scales of the lateral line with a dark streak extending down from it and another curving upward and forward, surrounded by a light court; sides and fins thickly punctated especially in a lateral band on a level with the humeral spot. Tip of first anal ray sometimes milk-white.

#### 10. *ASTYANAX* (*POECILURICHTHYS*) *ZONATUS* Eigenmann.

Plate 41, fig. 3.

*Astyanax zonatus* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 95; Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 432.

HABITAT.—Tabatinga.

#### *Specimens examined.*

| Catalogue number   | Number of specimens | Size in mm.                      | Locality  | Collector |
|--------------------|---------------------|----------------------------------|-----------|-----------|
| 20768 in part Type | 1                   | 59                               | Tabatinga | Bourget   |
| 20768 in part      | 2                   | 38, <sup>1</sup> 52 <sup>1</sup> | Tabatinga | Bourget   |
| 20753              | 2                   | 37, <sup>1</sup> 40 <sup>1</sup> | Tabatinga | Bourget   |
| 20766 in part      | 1                   | 34                               | Tabatinga | Bourget   |

Allied to *A. anterior* and *A. asymmetricus*; distinguishable from other members of the genus by its cross-bar-like caudal spot.

<sup>1</sup> To base of caudal.



Head 3.8; depth 3; scales 8 or 9-42 to 47-5 or 6; D. 11; A. 27-30; eye 2.56 in head; interorbital about equal to the eye.

Compressed, elongate, regularly elliptical to the base of the caudal peduncle. Preventral area rounded or flattish, without a median series of scales; post-ventral area keeled. Predorsal line feebly keeled, naked in front, some of the scales near the dorsal with their edges bent over the back and sometimes a median scale.

Occipital process equal to one fifth the distance of its base from the dorsal, bordered on the side by about 4 scales. Interorbital about equal to the eye, convex. Frontal fontanel not much shorter than the parietal, exclusive of the groove on the occipital process. Second interorbital bearing a naked area which is widest below. Premaxillary with four teeth in the front series, the second tooth removed from the line of the rest; second row with five teeth, their denticles arranged in a curved line. Maxillary with two minute teeth; lower jaw with four large teeth and a number of abruptly smaller ones of which the first three may be 3-pointed.

Gill-rakers about  $8 + 15$ ,  $\frac{1}{3}$  the diameter of the eye.

Scales cycloid, regularly imbricate, the rows not deflected to the anal and no auxiliary rows; each scale with several (2-11, usually 6-10) scarcely diverging striae. Caudal naked. Anal with a feeble sheath of a single row of caducous scales. Lateral line forming a downward curve to above the anal, the row of scales below it parallel with it for its entire length; axillary scale small.

Origin of dorsal a little in advance of middle of body, pointed, the next to the last ray nearly half as long as the highest, which is  $3\frac{3}{4}$  in the length. Caudal lobes slightly longer than the longest dorsal ray, the lower lobe a little the longer. Anal emarginate, the 10th ray about half as long as the longest; origin of anal and base of last dorsal ray equidistant from tip of snout. Ventrals scarcely reaching anal, their origin and the 3d scale in front of the dorsal equidistant from tip of snout. Pectorals reaching ventrals.

A faint, vertical humeral spot, a spur of it crossing the third scale of the lateral line; end of caudal peduncle whitish, a broad, dark bar crossing the base of the caudal, blackest in the center where it is continued to the end or to near the end of the middle rays. A narrow, silvery, lateral band.

Vertebrae  $13 + 19$ .

Anterior air-bladder two thirds as long as the posterior; the posterior sausage-shaped, but little decurved behind and ending bluntly.

Alimentary canal not quite equal to the entire length.



## 11. ASTYANAX (POECILURICHTHYS) BOURGETI Eigenmann.

Plate 40, fig. 1.

*Astyanax bourgeti* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 95; Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 432.

One specimen. 20768 part Type. 92 mm. Tabatinga. Bourget.

A well-marked species, differing from all others in the genus in its black lower fins.

Head  $3\frac{1}{3}$ ; depth  $2\frac{1}{3}$ ; D. 11; A. 34; scales 12-53-9; eye a little less than one third of the length of the head; interorbital 2.47.

Compressed; ventral profile regularly arched to the caudal peduncle; dorsal profile descending from the origin of the dorsal in both directions, anterior profile more arched above, depressed over the eye. Preventral area rounded, without a median series of scales, postventral area compressed. Predorsal line probably naked to near the dorsal.

Occipital process one fourth of the distance from its base to the dorsal, bordered by about 5 scales. Interorbital broad, smoothly arched but not greatly elevated. Anterior fontanel not much shorter than the posterior, exclusive of the groove on the occipital. Second suborbital leaving a rather wide naked area. Snout pointed. Maxillary equals length of eye. Mandible  $2\frac{1}{3}$  in head. Five 3-pointed teeth equidistant from each other in the front series of the premaxillary, the middle one somewhat withdrawn from the line, six teeth in the second row, their denticles in a nearly straight line. Maxillary with two minute teeth on one side and three on the other; five graduated teeth on each side of the lower jaw, followed by a series of minute teeth.

Scales regularly imbricate except over anal and the preventral region; three series of scales below the lateral line parallel with it, some interpolated rows below the third row above the anal; lateral line but little decurved.

Origin of dorsal equidistant from tip of snout and caudal, its highest ray about one fourth of the length. Origin of anal and base of last dorsal ray equidistant from tip of snout; base of anal equals distance of dorsal from caudal. Origin of ventrals and a point equal to two thirds of the base of the dorsal in front of the first ray equidistant from the tip of the snout and last but 7th anal ray. Ventrals reaching base of fourth anal ray. Pectorals to the fourth row of scales behind the origin of the ventrals.

A large, well-defined, horizontally ovate humeral spot on upper part of the



1st to 5th scales of the lateral line, and above those scales a conspicuous, silvery spot on its upper anterior corner; a narrow, faint, silvery band; a conspicuous black spot, about as large as the pupil on the base of the middle caudal rays; tips of middle half of caudal rays dusky; anal nearly uniformly dark; pectorals and ventrals profusely dotted, nearly black.

12. *ASTYANAX* (POECILURICHTHYS) *ABRAMOIDES* Eigenmann.

Plate 54, fig. 2.

*Tetragonopterus abramis* GÜNTHER (*non* Jenyns), Cat. fishes Brit. mus., 1864, 5, p. 321 (British Guiana, Essequibo); STEINDACHNER, Flussf. Südamer., 1879, 1, p. 18 (Orinoco, near Ciudad, Bolivar).  
*Astyanax abramoides* EIGENMANN, Ann. Carnegie mus., 1909, 6, p. 121; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432; Mem. Carnegie mus., 1912, 5, p. 357, pl. 52, fig. 4.

HABITAT.—Venezuela and Guiana.

*Specimens examined.*

| Catalogue number   | Number of specimens | Size in mm. | Locality                      | Collector |
|--------------------|---------------------|-------------|-------------------------------|-----------|
| 1028 C. Type.      | 1                   | 112         | Tumatumari, Potaro River      | Eigenmann |
| 1029 C., 11,727 I. | 86                  | 48–112      | Tumatumari, Potaro River      | Eigenmann |
| Paratypes          |                     |             |                               |           |
| 1030 C., 11,728 I. | 2                   | 99, 126     | Potaro Landing                | Eigenmann |
| 1031 C., 11,729 I. | 27                  | 60–126      | Kangaruma, Lower Potaro River | Eigenmann |
| 1032 C., 11,730 I. | 48                  | 56–108      | Amatuk Cataract, Potaro River | Eigenmann |
| 1033 C.            | 1                   | 54          | Rockstone, Essequibo River    | Eigenmann |
| 1034 C.            | 1                   | 46          | Gluck Island, Rockstone       | Eigenmann |
| 1035 C., 11,731 I. | 2                   | 56, 63      | Wismar, Demerara River        | Eigenmann |
| 1036 C., 11,732 I. | 3                   | 51–64       | Christianburg, Demerara River | Eigenmann |

Closely allied to *A. anterior* and *A. abramis* differing in the color of the caudal peduncle and caudal in both.

Head 4; depth 2.4–2.5; D. 11; A. usually 28<sup>1</sup>; scales 9 or 10–43 to 51<sup>2</sup>–7 or 8; eye 2.5–3; interorbital 2.5–2.6.

Elliptical, dorsal, and ventral outlines similar, without prominent humps, the profile slightly depressed over the eyes. Preventral area rounded, with small rather irregularly placed scales; postventral area narrowly rounded. Predorsal area, narrow, with a linear median naked area.

Occipital process equal to one fourth of the distance from its base to the dorsal, bordered by 4 scales on its sides; skull smooth in cross-section, very

<sup>1</sup> In those examined, one with 26, ten with 28, five with 29, three with 30.

<sup>2</sup> In those examined one with 43, four with 44, two with 45, four with 46, four with 47, one with 51.



convex. Interorbital much broader than the eye in adult. Frontal fontanel a little narrower than the parietal. Margin of second suborbital very convex; leaving a naked area, which is widest below. Maxillary equal to the eye; four or five teeth in the front row of the premaxillary, the third withdrawn from the line of the rest; five graduated teeth in the second row, their denticles in shallow crescents, maxillary with 2 or 3 minute teeth. Dentary with four large teeth abruptly followed by smaller ones on the sides.

Gill-rakers 8 + 11.

Scales of the sides regularly imbricate, a few interpolated scales over the anal muscles.

Anal sheath of a single row of scales along the base of the anterior rays; caudal naked; a well-developed axillary scale. Lateral line but little decurved. Each scale of the sides with a few nearly parallel striae.

Dorsal but little farther from snout than the ventral, nearer snout than caudal, its margin rounded, the highest ray about 3.75 in the length, the penultimate a little less than half as long as the highest. Anal emarginate, the 2nd and 10th reaching the base of the 18th when depressed; first anal ray below or behind the base of the last dorsal ray. Ventrals not reaching anal, pectorals to ventrals.

Highly iridescent, blue above, greenish to silvery below; a club-shaped horizontal humeral spot, its pointed anterior end from the upper margin of the first scale of the lateral line along the row of scales above the lateral line to above the 5th scale of the line; a dark vertical bar crossing the opercle, followed by a light bar, a second dark bar across the posterior part of the humeral spot, a second light bar and then a third dark bar shading into the profusely dotted sides. Cheeks profusely dotted; a dark median line, most prominent in young specimens preserved in formalin; this line not extending along the sides of the caudal peduncle; a black spot at the base of the caudal, its margins shading into the dusky caudal but not definitely continued to the end of the middle rays. These markings fading with age. In life all fins but pectorals tinged with orange or brick-red.

### 13. *ASTYANAX* (*POECILURICHTHYS*) *ANTERIOR* Eigenmann.

Plate 40, fig. 2.

*Astyanax anterior* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 95; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432.

HABITAT.—Tabatinga.



*Specimens examined.*

| Catalogue number |          | Number of specimens | Size in mm. | Locality  | Collector |
|------------------|----------|---------------------|-------------|-----------|-----------|
| 20768 part       | Type     | 1                   | 91          | Tabatinga | Bourget   |
|                  | Paratype | 1                   | 70          |           |           |

Allied to *A. asymmetricus*, distinguishable from all other species by the anterior position and sublinear character of its humeral spot.

Head 3.5; depth 2.8; D. 11; A. 28-32; scales 9.5 or 10-52 or 53-6; eye 3 +; interorbital 3.

Compressed; elliptical to the caudal peduncle; profile slightly depressed over the eye. Preventral area rounded, without a median series of scales; post-ventral area compressed to a narrow edge. Predorsal area compressed to a keel, the median line naked in front, some of the scales with the edge turned over the ridge near the dorsal, no median series of scales.

Occipital process about 5 in the distance from its base to the dorsal, bordered by 4 or 5 scales on the sides. Anterior fontanel but little shorter than the posterior, exclusive of the groove on the occipital process. Interorbital scarcely convex. Second suborbital leaving a considerable naked area which is widest below. Four to six teeth in the front row of the premaxillary, the third tooth, or if there are six teeth, the fourth out of line; five teeth in the second row, their denticles in a slightly curved line. Maxillary with one or two minute teeth. Mandible with four large teeth and numerous smaller ones.

Gill-rakers 8 + 14, about half the length of the orbit.

Scales regularly imbricate, the rows not deflected over the anal, no auxiliary rows; each scale with several subparallel lines; scales largest above the pectorals where the height of their exposed edge is nearly twice its length. Caudal naked, anal sheath of a single series of caducous scales. Lateral line but little decurved, the row of scales below it parallel with it; axillary scale well developed.

Dorsal pointed, its origin equidistant from tip of snout and caudal, its height 3.6-4 in the length. Caudal lobes 3.5 in the length. Origin of anal and first scale behind dorsal equidistant from tip of snout. Anal emarginate. Ventrals and the second scale in front of the dorsal equidistant from tip of snout, their tips just reaching anal. Tips of pectorals beyond origin of ventrals but not to end of axillary scale.

A silvery lateral band about one third as wide as eye; a horizontal black spot one fourth as wide as eye and rather longer than eye, beginning on the upper part of the first scale of the lateral line and extending straight back, pointed behind; middle caudal rays black; otherwise plain.



## 14. ASTYANAX (POECILURICHTHYS) ABRAMIS (Jenyns).

## Plate 42, fig. 2.

*Tetragonopterus abramis* JENYNS, Zool. Beagle. Fishes, 1842, p. 123, pl. 23, fig. 1 (Rio Paraná); GÜNTHER, Ann. mag. nat. hist., 1880, ser. 5, 6, p. 12 (La Plata); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 52; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 274; BOULENGER, Trans. Zool. soc. Lond., 1896, 14, p. 35 (Descalvados); PERUGIA, Ann. Mus. civ. stor. nat. Genova, 1891, ser. 2a, 10, p. 25 (Rio Madidi); EIGENMANN & KENNEDY, Proc. Acad. nat. sci. Phil., 1903, p. 521 (Asuncion; Arroyo Trementina).

*Astyanax abramis* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 439 (Peruvian Amazon); EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 28 (Paraguay); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432.

*Tetragonopterus orbignianus* CUVIER & VALENCIENNES, Hist. nat. poissons, 1848, 22, p. 147, in part (Buenos Aires).

HABITAT.—Buenos Aires to Paraguay, Upper Amazon; base of Andes east of Bogota.

*Specimens examined.*

| Catalogue number  | Number of specimens | Size in mm.     | Locality                          | Collector |
|-------------------|---------------------|-----------------|-----------------------------------|-----------|
| 20768             | 19                  | 64-104          | Tabatinga, Amazon                 | Bourget   |
| 20773             | 9                   | 55-90           |                                   |           |
| 10000 I.          | 1                   | 69 <sup>1</sup> | Asuncion, Paraguay                | Anisits   |
| 9999 I.           | 1                   | 51 <sup>2</sup> | Arroyo Trementina, Paraguay       | Anisits   |
| 11082 I.          | 1                   | 84              | Rio Coxipo, Matto Grosso          | Anisits   |
| 13629 I.          | 2                   | 109-139         | Quebrada Cramalote, Villavicencio | Gonzales  |
| 13630 I., 7321 C. | 6                   | 56-132          | Barrigon, Rio Meta                | Gonzales  |

One of the types of *Tetragonopterus orbignianus* Cuv. & Val. belongs to this variety.

This species is a modification of *A. bimaculatus*, from which it differs in the number of scales.

The following description is based on the specimens from the Amazon and the Paraguay.

Head 3.7 (4.2-4.4 in the specimens from Colombia), depth 2.5; D. 11: A. 30-34<sup>3</sup>; scales 7 to 10-38 to 49-6 or 7<sup>4</sup>; eye 3 in head; interorbital 2.7.

Silvery band well developed, a well-marked caudal spot, abruptly narrowed

<sup>1</sup> To base of caudal.

<sup>2</sup> 41 mm. to base of caudal.

<sup>3</sup> Of 30 examined five have 30 rays, five 31, eleven 32, five 33 and four 34. Of the specimens from Colombia one has 28, four 29 and three 30.

<sup>4</sup> Seven specimens from Tabatinga have 7-38-6; 7-39-6; 8-38-6; 7-41-6; 8-45-7; 7-48-6; 9-49-7; the three Paraguay Basin specimens have 10-46-7; 9-44-7; and 9-45-7. The specimens from Colombia have 9 or 10 —  $\frac{47}{1}$ ,  $\frac{48}{3}$ ,  $\frac{49}{2}$ ,  $\frac{50}{1}$ ,  $\frac{51}{1}$ , — 7 to 9.



on the caudal and continued to the end of about four rays, tapering forward traceable in favorable cases to below the dorsal as a dark streak in the middle of the lateral band; a dusky streak extending up and down from the humeral spot and another one parallel with it about three scales behind the humeral spot; the latter markings prominent in formalin specimens.

These specimens while quite different from some of the specimens of *A. bimaculatus* are similar to other specimens. They can be distinguished certainly only by the increased number of scales and even in this character they overlap typical specimens of *A. bimaculatus*.

# 15. ASTYANAX (POECILURICHYHYS) BIMACULATUS (Linné).

Plate 62, figs. 1, 2, 4, and 6; Plate 95, fig. 6.

*Charax* no. 54, GRONOVIVS, Mus. ichthyol., 1754, 1, p. 19, tab. 1, fig. 5.

*Albula maculata* LINNÉ, Museum Adolphi Frideric, 1754, p. 78, tab. 32, fig. 2.

*Tetragonopterus maculatus* MÜLLER & TROSCHER, Horae ichthyologicae, 1845, 1, p. 14, tab. 3, fig. 4; Fische Britisch Guiana, 1848, p. 634 (Rupununi; Essequibo); GÜNTHER, Cat. fishes Brit. mus., 1864, 5, p. 321 (Demerara; River Capin; Pernambuco); STEINDACHNER, Süßwf. südöstl. Bras., 1876, 3, p. 568, pl. 1, fig. 2 (Rio Parahyba; Rio Doce; Rio Mucuri); PETERS, Monatsb. Akad. wiss. Berlin, 1877, p. 472 (Calabozo); BOULENGER, Ann. mag. nat. hist., 1887, ser. 5, 19, p. 173 (Rio Grande do Sul); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 52; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 275; Perugia, Ann. Mus. civ. storia nat. Genova, 1891, ser. 2a, 10, p. 43 (Rio Paraguay; Asuncion and Villa Maria); BOULENGER, Boll. Mus. univ. Torino, 1895, 10, p. 3 (Colonia Risso); PELLEGRIN, Bull. Mus. hist. nat., 1899, 5, p. 157 (Apuré); REGAN, Proc. Zool. soc. Lond., 1906, p. 384 (Trinidad).

*Salmo bimaculatus* LINNÉ, Syst. nat., 1758, ed. 10, 1, p. 311; 1766, ed. 12, p. 513 (South America); Bloch, Ausländische fische, 1794, 8, p. 110, taf. 382, fig. 2; Bloch, Systema ichthyologicae, ed. Schneider, 1801, p. 413.

*Charax bimaculatus* GRONOW, Syst. ichthyol., ed. Gray, 1854, p. 151.

*Astyanax bimaculatus* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 432 (Peruvian Amazon; Headwaters of the Tocantins); EIGENMANN and OGLE, Proc. U. S. N. M., 1907, 33, p. 27, in part (Para; British Guiana); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432; Mem. Carnegie mus., 1912, 5, p. 359.

*Tetragonopterus linnaci* CUVIER & VALENCIENNES, Hist. nat. poissons, 1848, 22, p. 142 (Cayenne).

*Tetragonopterus gronovii* CUV. & VAL., Loc. cit., p. 143 (Surinam); KNER & STEINDACHNER, Abhandl. Bayer. akad. wiss., 1864, 10, p. 46 (Rio Bayano).

*Tetragonopterus orbignianus* CUV. & VAL., Loc. cit., p. 147 in part (Buenos Aires).

*Poecilurichthys brevoortii* GILL, Ann. Lyc. nat. hist. N. Y., 1858, 6, p. 57 (Trinidad); GÜNTHER, Cat. fishes Brit. mus., 1864, 5, p. 317.

*Tetragonopterus bartletti* GÜNTHER, Ann. mag. nat. hist., 1865, ser. 3, 18, p. 30 (Upper Amazon); COPE, Proc. Acad. nat. sci. Phil., 1871, p. 260 (Ambyiacu).

*Astyanax bartletti* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 343, fig. 31 (Ambyiacu).

*Tetragonopterus orientalis* COPE, Proc. Amer. philos. soc., 1870, 11, p. 559 (Para); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 54; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 279.

*Astyanax orientalis* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 434, fig. 35.

*Astyanax microstoma* HENSEL (non Günther) Wieg. archiv., 1870, p. 83.

*Tetragonopterus caudimaculatus* COPE, Proc. Amer. philos. soc., 1894, 33, p. 107 (Headwaters of Tocantins).

*Tetragonopterus jacuhiensis* COPE, Proc. Amer. philos. soc., 1894, 33, p. 88 (Rio Grande do Sul); ULREY, Ann. N. Y. acad. sci., 8, 1895, p. 280; FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 435 (Jacuhy).



- Tetragonopterus lacustris* BOULENGER (*non* Lütken), Trans. Zool. soc. Lond., 1896, **14**, p. 35 (Descalvados and North Paraguay); EIGENMANN & NORRIS, Revista Mus. Paulista, 1900, **4**, p. 357 (Piracicaba).  
*Astyanax lacustris* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 433 (Para; Peruvian Amazon).  
*Tetragonopterus maculatus lacustris* EIGENMANN, Ann. N. Y. acad. sci., 1894, **7**, p. 633 (Rio Grande do Sul); ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 275; EIGENMANN & KENNEDY, Proc. Acad. nat. sci. Phil., 1903, p. 521 (Asuncion; Estancia la Armonia; Arroyo Trementina).  
*Astyanax rupununi* FOWLER, Proc. Acad. nat. sci. Phil., 1914, p. 243, fig. 6 (Rupununi).

HABITAT.— Eastern slope from about 3000 feet to the ocean, Buenos Aires to the Orinoco Basin, Magdalena.

*Specimens examined.*

| Catalogue number    | Number of specimens | Size in mm.        | Locality                                     | Collector         |
|---------------------|---------------------|--------------------|--|-------------------|
| 1354 C.             | 1                   | 102                | Maripicru, branch of the Ireng.              | Grant             |
| 1355 C., 11847 I.   | 5                   | 87-133             | Holmia                                       | Eigenmann         |
| 1356 C., 11848 I.   | 102                 | 37-142             | Georgetown Trenches                          | Eigenmann         |
| 1357 C., 11848 I.   | 122                 | 51-126             | Botanic Garden, Georgetown                   | Shideler          |
| 1358 C., 11850 I.   | 7                   | 74-85              | Lama Stop-Off                                | Eigenmann         |
| 1359 C.             | 1                   | 79                 | Madoonie Creek                               | Eigenmann         |
| 1360 C., 11851 I.   | 2                   | 85 & 84            | Mora Passage                                 | Shideler          |
| 855                 | 2 <sup>1</sup>      | 26 & 56            | Surinam                                      | Wyman             |
| 11308 I.            | 2                   | 137 & 140          | Trinidad                                     | Guppy             |
| 26093               | 1                   | 127                | Trinidad                                     | Garman            |
| 21024, 21025        | 4                   | 76-142             | Para, Marajo                                 | Magalhaes         |
| 824                 | 2                   | 55-62              | Para   | Coske             |
| 21021, 21022, 21023 | 59 <sup>2</sup>     | 68-115             | Para   | Agassiz & Bourget |
| 21075               | 1 poor              | 67                 | São Pedro                                    | Thayer Exped.     |
| 21063, 21064        | 3                   | 72-90              | Arary  | Thayer Exped.     |
| 21077               | 5                   | 72-85              | Porto do Moz                                 | Vinhas            |
| 20848               | 1                   | 60                 | Obidos                                       | Bentos            |
| 1200                | 3                   | 48-110             | Pernambuco                                   | Fletcher          |
| 21020               | 21                  | 72-124             | Pernambuco                                   | Agassiz & Bourget |
| 20697               | 1                   | about 100          | Brazil                                       | Senden            |
| 20900               | 3                   | 118-about 145      | Itabapuna                                    | Hartt & Copeland  |
| 21050               | 2                   | 54-59              | Piabana                                      | Thayer Exped.     |
| 20915               | 2                   | 68-74              | Rio Arassuahy                                | Hartt & Copeland  |
| 21082               | 11                  | about 70-82 (poor) | St. Anna de Ferres, Rio San Antonio          | Thayer Exped.     |
| 20902, 20904        | 3                   | 68-80              | Rio Jequitinhonha                            | Hartt & Copeland  |
| 20918               | 7                   | 63-75              | Santa Clara, Rio Mucuri                      | Hartt & Copeland  |
| 20910               | 46                  | about 65-130       | Rio Doce between Linhares and Porto de Souza | Hartt & Copeland  |
| 20917               | 31                  | 87-134             | Minas Geraes                                 | Hartt & Copeland  |

<sup>1</sup> This specimen has but 27 anal rays and scales 7-37-6.

<sup>2</sup> Very variable, one 89 mm., has nearly all the characters assigned by Cope to his *orientalis* including depth 2; head 4; others of the same length have depth 2.3.



| Catalogue number                 | Number of specimens | Size in mm.  | Locality                     | Collector          |
|----------------------------------|---------------------|--------------|------------------------------|--------------------|
| 20684, <sup>1</sup> 20928, 20932 | 44                  | 69-160       | Rio Parahyba                 | Thayer Exped.      |
| 20935, 20940-20942               |                     |              |                              |                    |
| 20946                            | 1                   | 63           | Juiz de Fora                 | Thayer Exped.      |
| 20882, 20884                     | 3                   | 97-101       | São Matheos                  | Hartt & Copeland   |
| 20892, 20894-20897               | 18                  | 48-113       | Muriahe                      | Hartt & Copeland   |
| 20887, 20889                     | 7                   | 70-120       | Mendez                       | Hartt & Copeland   |
| 20876, 20877                     | 12                  | 7-145        | Campos                       | Hartt & Copeland   |
| 20685                            | 4                   | 107-128      | Rio de Janeiro, Rio Parahyba | Agassiz & Bourget  |
| 21058, 21060                     | 7                   | 42-120       | Rio de Janeiro               | Thayer Exped.      |
| 9266 I.                          |                     | 43-about 104 | Piracicaba                   | von Ihering        |
| 11635 I.                         | 7                   | 84-134       | Piracicaba                   | von Ihering        |
| 4888 I.                          | 1                   | about 110    | Rio Grande do Sul            | von Ihering        |
| 20695 part                       | 1                   | about 107    | Rio Grande do Sul            | Dom Pedro II       |
|                                  | 1                   | 126          | Rosario, La Plata            | Capt. S. G. Brooks |
| 837                              | 1                   | 93           | Buenos Aires                 | Capt. S. G. Brooks |
| 846                              | 3                   | about 68-85  | Uruguay River                | Wyman              |
| 4308 I.                          | 1                   | 78           | Para                         | Hartt              |
| 5171 I.                          | 2                   | 48-62        | Lower Amazon                 | Hartt              |
| 5178 I.                          | 3                   | 40-about 52  | Ditches of Para              | Hartt              |
| 12815 I., 5009 C.                | 90 <sup>2</sup>     | largest 117  | Perené                       | Lola Vance         |

The following specimens in the Carnegie Museum were collected by Mr. J. Haseman.

| Catalogue number | Number of specimens | Size in mm.        | Locality  |
|------------------|---------------------|--------------------|---|
| 3236 C.          | 16 <sup>3</sup>     | 43-88              | Pirapora, upper San Francisco                           |
| 3237 C.          | 3                   | 44-50              | Lagoa Pereira   |
| 3238 C.          | 1 <sup>4</sup>      |                    | Lagoa da Porto  |
| 3239 C.          | 4                   | 53-61              | Lagoa da Porto  |
| 3240 C.          | 24                  | 28-85              | Barreiras   |
| 3241 C.          | 12 <sup>5</sup>     | 22-54 (about)      | Lagoa of Rio Grande, Boqueirão, near mouth of Rio Preto |
| 3242 C.          | 30                  | about 35-80        | Santa Rita  |
| 3243 C.          | 4                   | 30-73              | Penedo  |
| 3245 C.          | 2                   | 61-65 <sup>6</sup> | No label  |
| 3246 C.          | 11                  | 48-86              | Sete Lagoas   |
| 3247 C.          |                     | 34-88              | Rio das Velhas  |
| — C.             | 6                   | 37-47              | Lagoa de Parnagua of the Parana-hyba Basin              |

<sup>1</sup> In one the humeral spot is exceedingly pale.

<sup>2</sup> Scales in five specimens 35, 35, 36, 36, 36; anal rays in five specimens 26, 26, 26, 27, 28. Humeral spot large.

<sup>3</sup> Depth  $2\frac{1}{3}$ -3. A. 25, 27, 26. Scales 32, 34-36.

<sup>4</sup> Depth 2.75, D. 27; Scales 43, lateral line broken on caudal peduncle.

<sup>5</sup> These specimens show how a lateral spot arises from a vertical band.

<sup>6</sup> To base of caudal.



| Catalogue number | Number of specimens | Size in mm.    | Locality  |
|------------------|---------------------|----------------|---|
| 3253 C.          | 4 <sup>1</sup>      | 64-79          | Entre Rios                                      |
| 3254 C.          | 33                  | 54-109         | Campos, June 13-14, 1908                        |
| 3255 C.          | 4                   | 76-86          | Muniz Freire                                    |
| 3256 C.          | 12                  | 48-68          | São João da Barra                               |
| 3257 C.          | 9                   | 57-77          | Lagoa Feia, Tocas                               |
| 3258 C.          | 2                   | 87             | Barra da Pirahy                                 |
| 3259 C.          | 3                   | 70-78          | Jacarehy  |
| 3260 C.          | 23                  | 37-56          | São João del Rei                                |
| 3262 C.          | 1                   | 84             | Rio Paranahyba Bridge, Goyaz                    |
| 3261 C.          | 4                   | 98-115         | São João del Rei                                |
| 3263 C.          | 17                  | 60-118         | Jaguara   |
| 3264 C.          | 17                  | 37-58          | Mogy Guassu                                     |
| 3265 C.          | 4                   | 46-61          | Bebedouro                                       |
| 3266 C.          | 3                   | 78-145         | Piracicaba                                      |
| 3267 C.          | 33                  | 36-76          | Salto Avandava                                  |
| 3268 C.          | 2                   | 60-68          | Itapura   |
| 3269 C.          | 9                   | 55-61          | Miguel Calmon, a lake four miles from town      |
| 3270 C.          | 2                   | 109            | Xiririca, Rio Iguapé                            |
| 3271 C.          | 2                   | 41-46          | Porto Alegre, a creek west of Rio Grande do Sul |
| 3272 C.          | 2                   | 41-46          | Cacequy   |
| 3273 C.          | 10                  | 25-102         | Uruguay and Uruguay Basin                       |
| 3274 C.          | 31 <sup>2</sup>     | 33-57          | Porto Alegre                                    |
| 3275 C.          | 2                   | 59-92          | San Joaquin                                     |
| 3276 C.          | 8                   | 53-79          | Barragança                                      |
| 3277 C.          | 1                   | 42             | Para  |
| 13626 I.         | 1                   |                | Barrigon, Rio Meta                              |
| 13760 I.         | 60                  | largest 95 mm. | Santa Anna, Rio Urubamba, 3,400 ft.             |

Gonzales Coll.

E. Heller Coll.

Head 3.5-4.3; depth 2-2.6; D. 11; A. 21-43<sup>3</sup>; scales 6 to 8-31 to 41<sup>4</sup>-5 to 7; eye about 3, interorbital 2.3-2.4 in the head.

More or less regularly elliptical, varying from regularly elliptical to sub-rhomboidal; compressed but not excessively so. Preventral area rounded, without a median series of scales. Predorsal area narrowly rounded, a little broader than the postventral area; a few median scales near the dorsal, then

<sup>1</sup> A. 31; scales 8-38-7 (to ventrals).

<sup>2</sup> The specimens furnish an interesting variant. The lateral line is 35 in three, 36 in two, 37 in three, and 38 in one. The anal is 25 in one, 26 in two, 27 in four, 28 in one and 43 in one. The 43 rays occupy the same space occupied by the 27 in the others. The scales over the muscles of the anterior part of the fin are also much smaller and more numerous. The last ten rays occupy as much space as the last nine rays in normal specimens and over these the scales are normal.

<sup>3</sup> See p. 255 for details.

<sup>4</sup> See p. 255 for details.



a few scales with their margins bent over the back, then the median line naked.

Occipital process between one third and one fourth of the distance from its base to the dorsal, bordered by 4 scales on each side. Interorbital area broad, convex. Parietal fontanel about twice as long as frontal, exclusive of the groove on the occipital process. Second suborbital leaving a narrow naked area around the entire free border; a distinct notch between the preorbital and the first suborbital. Maxillary very oblique, 3.5-3.75 in the head, a little longer than the snout. Usually four (3-5) teeth in the front row of the premaxillary forming a compact series, of which the third may be somewhat withdrawn from the straight line; five teeth in the second row, the denticles of the larger ones arranged in a series ranging from a crescent to a U. Maxillary without teeth or with one small one. Four large teeth on the dentary and numerous small ones on the side.

Gill-rakers about  $10 + 15$ ,  $\frac{2}{3} - \frac{1}{2}$  the length of the eye.

Scales cycloid, with a variable number of divergent striae, regularly imbricate except on the predorsal and preventral area and sometimes over the anal musculature, the regular imbrication of one side joined to that of the other irregularly in the preventral area; near the dorsal the uppermost row of scales of the sides separated from that of the other side by a series of median scales, but further forward, usually meeting irregularly and directly along the middle line without median scales. Sometimes the median series of scales extends forward to within a few scales of the occipital process; over the anal muscles there are interpolated scales varying in number in different specimens. Anal sheath consisting of two rows of scales which are free from the rays. Caudal lobes without attached scales but with a basal sheath of large scales; axillary scale well developed.

Origin of dorsal a little nearer tip of snout than base of caudal, its penultimate ray  $2\frac{1}{2}$  in its longest ray, which is about one fourth of the length. Anal slightly emarginate in the young, straight in the adult, the longest rays in the largest specimens equal snout and eye in length, the shortest equal to snout and eye to pupil. Origin of ventrals and fourth scale in front of the dorsal equidistant from tip of snout; origin of ventrals equidistant from tip of snout and origin of caudal in the extreme young, and last fourth of anal in the oldest. Ventrals reaching anal in the youngest, falling considerably short in the oldest. Pectorals reaching slightly beyond origin of ventrals.

A well-defined, horizontally elongate, black humeral spot on the third to the sixth, or second to the fifth, scale in the series above the lateral line and on



the series above this, surrounded by a pale area; a spot on the caudal peduncle, fading out forward and continued behind to the tip of the middle caudal rays; caudal markings varying greatly in intensity. Sides silvery or brassy; sometimes a dusky cross-shade behind the pale area surrounding the humeral spot.

Vertebrae 13 + 19.

Air-bladders very large, the posterior one regularly curved, ending conically near the origin of the anal, twice as long as the anterior,  $2\frac{1}{2}$  times as long as wide, its width  $2\frac{1}{2}$  in the head.

Alimentary canal about equal to the total length.

This species varies very much in shape with the sex and with the character of its individual habitat. It also varies much in more constant characters, *i. e.* such as are not dependent on age, sex, or nutriment, with the geographical distribution. The specimens from the Rio San Francisco and Bahia seem to occupy the center from which the characters of the specimens to the north as well as those to the south vary. These variations have for the most part received distinct names which may be retained as varietal designations. Still other deviations are so well separated that they are recognized as distinct species.

The following table (p. 255) indicates the total variation of the species and its immediate relatives in the number of anal rays and scales in the lateral line, as well as the range of variation in each locality.

16. *ASTYANAX* (*POECILURICHTHYS*) *BIMACULATUS BOREALIS* Eigenmann.

*Tetragonopterus maculatus* STEINDACHNER, Denks. K. akad. Wien, 1878, **39**, p. 58 (Rio Magdalena); 1880, **42**, p. 73 (Rio Cauca near Caceres, Colombia).

*Astyanax bimaculatus borealis* EIGENMANN, Bull. M. C. Z., 1908, **52**, p. 96; Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 432.

HABITAT.— Magdalena Basin.

In nine specimens from the Cauca and Magdalena Steindachner found one with 32 anal rays, three with 38, and the rest with between 36–39. This would give the usual number to be 38 and the average 37. The nearest average number of anal rays in *A. bimaculatus* in any other locality is 32.2. This difference is worthy of nominal recognition. I have seen no specimens.

The species is evidently restricted locally.



Anal rays and scales of the lateral line in *Astyanax bimaculatus*, its varieties, and of *A. orthodus*.

|  | ANAL RAYS |    |    |    |    |    |    |    |    |    |    | LATERAL LINE |    |    |    |    |    |    |    |    |    |  |
|--|-----------|----|----|----|----|----|----|----|----|----|----|--------------|----|----|----|----|----|----|----|----|----|--|
|  | 21        | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32           | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 |  |
| Cauca ( <i>vide</i> Steindachner) <sup>1</sup> ..... |           |    |    |    |    |    |    |    | 1  | 5  | 2  | 2            | 3  | 1  |    | 2  | 4  | 7  | ×  | ×  |    |  |
| Atrato and Patia <sup>2</sup> .....                  |           |    |    |    |    |    |    |    | 1  |    | 1  |              | 1  |    |    |    | 2  | 1  | 2  | 1  | 2  |  |
| Trinidad <sup>3</sup> .....                          |           |    |    |    |    |    |    |    | 1  | 4  | 3  | 9            | 3  | 1  |    |    |    | 1  | 8  |    |    |  |
| Guiana.....  |           |    |    |    |    |    |    | 1  | 1  | 4  | 3  | 6            | 5  | 6  | 3  |    | 2  | 5  | 9  | 11 | 4  |  |
| Lower Amazon.....                                    |           |    |    |    |    |    |    |    | 1  | 7  | 9  | 7            | 1  |    |    | 1  | 2  | 12 | 6  | 4  |    |  |
| Goyaz <sup>4</sup> .....                             |           |    |    |    |    |    |    |    |    |    |    | 2            | 1  |    |    |    |    |    | 1  |    |    |  |
| Itabapua.....  |           |    |    |    |    |    |    |    | 3  | 4  | 15 | 15           | 6  |    |    | 2  | 14 | 8  | 4  |    |    |  |
| Paralyba.....  |           |    |    |    |    |    |    |    | 1  | 3  | 2  | 1            |    |    |    | 1  | 1  | 1  |    |    |    |  |
| Mucuri.....  |           |    |    |    |    |    |    |    |    |    |    |              |    |    | 1  | 5  | 3  |    |    |    |    |  |
| Rio Doce.....  |           |    |    |    |    |    |    | 1  | 12 | 12 | 7  | 1            |    |    |    |    |    |    |    |    |    |  |
| Jequinhonha.....                                     |           |    |    |    | 1  | 1  |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
| Rio Janeiro.....                                     |           |    |    |    |    |    |    | 2  | 2  | 1  | 2  |              |    |    |    | 2  | 1  | 1  |    |    |    |  |
| Upper Rio Grande Basin.....                          |           |    |    |    | 3  | 8  | 7  | 10 | 6  | 3  | 2  | 1            |    |    | 2  | 18 | 14 | 4  | 2  |    |    |  |
| Pernambuco.....                                      |           |    |    |    |    | 1  | 4  | 4  | 5  | 3  | 1  |              |    |    |    |    |    |    |    |    |    |  |
| Paraguay <sup>5</sup> .....                          |           |    |    |    |    |    | 2  | 1  | 4  | 32 | 18 | 5            | 3  |    |    |    |    |    |    |    |    |  |
| Itapicuru Basin <sup>6</sup> .....                   |           |    |    |    | 3  | 5  | 5  | 5  |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
| Bahia <sup>6</sup> .....                             |           |    |    |    |    | 1  | 2  | 5  | 3  |    |    |              |    |    |    |    |    |    |    |    |    |  |
| San Francisco <sup>6</sup> .....                     | 1         |    | 3  | 6  | 6  | 12 | 17 | 3  |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
| Perene <sup>6</sup> .....                            |           |    |    |    |    | 3  | 1  | 1  |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
| Rio Sapon <sup>7</sup> .....                         |           |    |    | 3  | 4  | 3  |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
| Porto Alegre <sup>8</sup> .....                      |           |    |    |    | 1  | 2  | 4  | 1  |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
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|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
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|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
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|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
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|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
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|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |
|  |           |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |  |

<sup>1</sup> borealis<sup>2</sup> orthodus.<sup>3</sup> brevoortii.<sup>4</sup> paraguayensis.<sup>5</sup> vittatus.<sup>6</sup> lacustris.<sup>7</sup> novae.<sup>8</sup> One from this locality has 43 rays.



17. *ASTYANAX* (*POECILURICHTHYS*) *BIMACULATUS* *PARAGUAYENSIS*, subsp. nov.

Plate 62, fig. 5. Plate 92, fig. 1.

*Astyanax bimaculatus lincatus* EIGENMANN & OGLE (*non* Perugia), Proc. U. S. N. M., 1907, **33**, p. 27 (Paraguay); EIGENMANN, Ann. Carnegie mus., 1907, **4**, p. 137 (Asuncion; Corumba; Bahia Negra; Puerto Max; Sapucay); Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 433.

HABITAT.—Paraguay and Upper Tocantins.

*Specimens examined.*

| Catalogue number | Number of specimens | Size in mm.         | Locality              | Collector |
|------------------|---------------------|---------------------|-----------------------|-----------|
| 10005-6 I.       | 4                   | about 68-—about 115 | Asuncion              | Anisits   |
| 10008 I.         | 15                  | 27-85               | Bahia Negra           | Anisits   |
| 10241 I.         | 1                   | 35                  | Bahia Negra           | Anisits   |
| 10247 I.         | 1                   | 75 <sup>1</sup>     |                       |           |
| 10244 I.         | 1                   | about 90            | Corumba               | Anisits   |
| 10293 I.         | 3                   | 23-26 <sup>1</sup>  | Puerto Max.           | Anisits   |
| 10239 I.         | 12                  | 26-55               |                       |           |
| 10243 I.         | 7                   | 29-49               |                       |           |
| 11083 I.         | 1                   | 59                  | Caiza, Bolivian Chaco |           |
| 10007 I.         | 17                  | about 35-74         | Arroyo Trementina     | Anisits   |
| 10009 I.         |                     |                     |                       |           |
| 10010 I.         |                     |                     |                       |           |
| 10242 I.         |                     |                     |                       |           |
| 10243 I.         |                     |                     |                       |           |
| 20691            | 79                  | about 37-116        | Goyaz                 | Honorio   |
| 3280 C.          | 7                   | 30-93               | Asuncion              | Haseman   |
| 3281 C.          | 11                  | 64-130              | Sapucay               | Haseman   |
| 3282 C.          | 2                   | 45                  | Villa Hays            | Haseman   |
| 3283 C.          | 3 <sup>2</sup>      | —63                 | Villa Hays            | Haseman   |
| 3284 C.          | 2                   | 48, 78              | Urucum Mts., Corumba  | Haseman   |
| 3285 C.          | 6                   | 39-67               | Caceres               | Haseman   |
| 3286 C.          | 1                   | 89                  | San Francisco         | Haseman   |
| 3287 C.          | 2                   | 45, 55              | Rio Santa Rita        | Haseman   |
| 3274 C.          | 4                   | 40-136              | Boa Ventura           | Haseman   |

This variety is distinguished from typical *A. bimaculatus* by the rows of spots along the centers of the scales.

<sup>1</sup> To base of caudal.<sup>2</sup> The last three are nearly plain and have prominent lips.



18. *ASTYANAX* (*POECILURICHTHYS*) *BIMACULATUS VITTATUS* (Castelnau).

*Tetragonopterus vittatus* CASTELNAU, Exped. Amer. Sud. Poissons, 1855, p. 66, pl. 33, fig. 3 (Bahia).

*Tetragonopterus bahiensis* STEINDACHNER, Süßw. südöstl. Bras., 1876, **3**, p. 13 (Bahia); EIGENMANN and EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 52; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 281; GILBERT, Proc. Wash. acad. sci., 1900, **2**, p. 162 (reef at Mamanguape).

HABITAT.—Bahia.

*Specimens examined.*

| Catalogue number | Number of specimens | Size in mm. | Locality                   | Collector     |
|------------------|---------------------|-------------|----------------------------|---------------|
| 20942            | 12                  | 55-95       | Bahia                      | Thayer Exped. |
| 3248 C.          | 1                   | 40-54       | Queimadas, Rio Itapicurú   | Haseman       |
| 3249 C.          | 6 <sup>1</sup>      | 40-63       |                            |               |
| 3299 C.          | 7                   | 45-96       | Rio Coite                  | Haseman       |
| 3298 C.          | 2                   | 38, 46      | Rio Jacobina               | Haseman       |
| 3301 C.          | 1                   | 43          | Rio Itapicurú <sup>2</sup> | Haseman       |
| 3244 C.          | 16                  | 37-51       | Cachoeira                  | Haseman       |
| 3250 C.          | 7                   | 25-50       | Alagoinhas, Rio Catu       | Haseman       |

In a number of specimens examined the anal rays and the lateral line are:—

|                      | ANAL RAYS |    |    |      |      | LATERAL LINE |      |    |    |    |
|----------------------|-----------|----|----|------|------|--------------|------|----|----|----|
|                      | 25        | 26 | 27 | 28   | 29   | 32           | 33   | 34 | 35 | 36 |
| Itapicurú Basin..... | 3         | 5  | 5  | 5    | .... | 3            | 7    | 9  | 2  |    |
| Cachoeira.....       | ....      | 2  | 5  | 2    | 1    | ....         | 3    | 4  | 4  | 1  |
| Alagoinhas.....      | 1         | 1  | 1  | .... | .... | 1            | .... | 2  |    |    |

These specimens thus grade into those of the Rio San Francisco.

The only variety of this genus from Bahia that can possibly have been used by Castelnau for his figure of *A. vittatus* is the one that was later designated as *A. bahiensis* by Steindachner. It is most nearly related to, and only distinguishable in the aggregate from the *A. lacustris* of its neighboring stream, the San Francisco. The usual number of anal rays is 27; the usual number of scales 34.

<sup>1</sup> One small specimen has a stuttering lateral line.

<sup>2</sup> Six miles north of Bom Fin at Fazenda Amaratu.



19. *ASTYANAX* (*POECILURICHTHYS*) *BIMACULATUS LACUSTRIS* (Lütken).

Plate 62, fig. 3.

*Tetragonopterus lacustris* LÜTKEN, Overs. K. Dan. selsk. Forh., 1874, p. 131 (Lagoa Santa); LÜTKEN, Vidensk. selsk., 1875, 12, p. 208, pl. 5, fig. 15 (Rio das Velhas); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 52; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 433.

HABITAT.—Rio San Francisco.

*Specimens examined.*

| Catalogue number | Number of specimens | Size in mm.     | Locality                           | Collector        |
|------------------|---------------------|-----------------|------------------------------------|------------------|
| 20923            | 3                   | 74-92           | Rio San Francisco, below the Falls | Hartt            |
| 20925            | 1                   | 64 <sup>1</sup> |                                    |                  |
| 21035            | 6                   | 112-134         | Lagoa Santa                        | Allen & St. John |
| 21041            | 2                   | 51-53           | Rio San Francisco                  |                  |
| 21042            | 6                   |                 |                                    |                  |
| 21045            | 23                  |                 | Lagoa Santa                        |                  |
| 21043            | 39                  |                 |                                    |                  |
| 20875            | 34 <sup>2</sup>     | about 34-132    | ?Lagoa Santa                       | Sceva            |
| 21028, 21029     | 11                  | 82-125          | Bon Jardin, Rio San Francisco      | Allen & St. John |
| 3300 C.          | 6                   | 55-75           | Lagoa Salgado, Salitre Basin       | Haseman          |
| 3302 C.          | 4                   | 49-58           | São Thomé, Salitre Basin           | Haseman          |

The usual number of anal rays for this variety is 27, the average 26, the scales of the lateral line are usually 33-35.

The depth of the largest specimens in 20875 varies from 1.9-2.2 in the length; the anal rays vary from 23-27; the scales from 33-35.

20. *ASTYANAX* (*POECILURICHTHYS*) *BIMACULATUS NOVAE* Eigenmann.

Plate 52, fig. 3.

*Astyanax bimaculatus novae* EIGENMANN, Ann. Carnegie mus., 1911, 8, p. 175, pl. 7, fig. 2.

HABITAT.—Eastern tributary of Rio Tocantins.

<sup>1</sup> To base of caudal.

<sup>2</sup> These are marked Brazil (Sceva). Inasmuch as their rays and fins correspond with Rio San Francisco specimens and with none others, and Sceva collected at Lagoa Santa, there can be little doubt as to the locality.



*Specimens examined.*

| Catalogue number | Number of specimens | Size in mm. | Locality  | Collector |
|------------------|---------------------|-------------|---|-----------|
| 3278 C. Cotypes  | 13 <sup>1</sup>     | 40-63       | Rio Sapon, Prazer, Bahia                              | Haseman   |
| 3279 C.          | 13                  | 35-85       | Above Cachoeira da Velha, de Rio Nova, Goyaz, Piabana | Haseman   |

These specimens agreeing with the Rio San Francisco specimens in the anal rays and number of fin rays differ in having a black lateral stripe replacing the silvery band. The dark in the axils of the scales is also more conspicuous.

21. *ASTYANAX (POECILURICHTHYS) JANEIROENSIS* Eigenmann.

## Plate 42, fig. 1.

*Astyanax janeiroensis* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 96; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 433.

One specimen. 21057 Type. 92 mm. Rio de Janeiro. Thayer Expedition.

This species is closely related to *A. bimaculatus*. It differs conspicuously from typical specimens of *A. bimaculatus* from Rio de Janeiro in its much more elongate form.

Head 4; depth  $2\frac{5}{8}$ ; D. 11; A. 26; scales 6-38-5; eye 3.5; interorbital  $2\frac{3}{8}$ ; two maxillary teeth; denticles of the second series of premaxillary teeth in a crescent.

Pectorals not quite reaching ventrals, base of anal equals the space between the dorsals.

Width of body  $2\frac{4}{11}$  in the depth (3-3.4 in all specimens of *A. bimaculatus* from Rio de Janeiro); predorsal line entirely scaled, with an almost complete series of median scales.

A faint basal caudal spot not continued on the middle rays in the type which is very much bleached.

The following specimens<sup>2</sup> differ from the type of *A. janeiroensis* in having

<sup>1</sup> A. 24 in 3, 25 in 4, 26 in 3; L. 1. 32 in one, 33 in 2, 34 in 3, 35 in 4.

| <sup>2</sup> Catalogue number | Number of specimens | Size in mm. | Locality         | Collector |
|-------------------------------|---------------------|-------------|------------------|-----------|
| 3288                          | 8                   | 83-119      | Iguape           | Haseman   |
| 3289                          | 6                   | 39-110      | Agua Quente      | Haseman   |
| 3290                          | 2                   | 71-105      | Iporanga         | Haseman   |
| 3291                          | 1                   | 106         | Morretes, Paraná | Haseman   |



one or two additional rows of scales between the lateral line and the dorsal and usually one more than the type from the lateral line to the ventrals. The anal varies from 22–25. The color-differences of course count for little because the type is extremely faded. The humeral spot is very large and heavy; the caudal spot is continued forward as a dark band and to the tips of the middle caudal rays. The lateral line in one case lacks five pores of being complete. The species is evidently closely related to *A. wappi*.

22. *ASTYANAX* (*POECILURICHTHYS*) *GOYACENSIS* Eigenmann.

*Astyanax goyacensis* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 96.

One specimen. 20692 part Type. 76 mm., to base of caudal. Goyaz. Honorio.

This specimen differs in shape from all specimens of *A. bimaculatus* from Goyaz, so that it could not be confounded with them. It is much more elongate and heavier in front.

Denticles of the teeth of the second row of the premaxillary in a deep crescent.

Head 4; depth  $2\frac{2}{7}$ ; D. 11; A. 25; scales 7–38–5; eye 3.4; interorbital 2.25; width of body  $2\frac{7}{11}$  in its depth (over 3 in *A. bimaculatus*); pectorals not reaching ventrals; no interpolated rows of scales over anal; jaws equal (the teeth of the outer row of the premaxillary exposed when the mouth is closed in *A. bimaculatus*) second suborbital covering the entire cheek (leaving a naked margin in *A. bimaculatus*); one maxillary tooth; scales above the anal with four or more striae.

The narrow caudal spot continued to the end of the middle rays.

23. *ASTYANAX* (*POECILURICHTHYS*) *ORTHODUS* Eigenmann.

Plate 42, fig. 3.

*Astyanax orthodus* EIGENMANN, Proc. U. S. N. M., 1907, 33, p. 27 (Truando); Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 433.

HABITAT.—Western Colombia in both Pacific and Atlantic drainage.



*Specimens examined.*

| Catalogue number      | Number of specimens | Size in mm.         | Locality                 | Collector        |
|-----------------------|---------------------|---------------------|--------------------------|------------------|
| 55655 U.S.N.M. Type 1 | 1                   | 92 <sup>1</sup>     | Truando, Colombia        | Michler & Schott |
| 5393 C., 13086 I.     | ∞                   | 132 <sup>2</sup>    | Truando                  | Wilson           |
| 5421 C., 13108 I.     | 6                   | 68-132 <sup>1</sup> | Creek Altacar, Barbacoas | Henn & Wilson    |
| 4918 C., 12758 I.     | 2                   | 85, 100             | Quibdo                   | Eigenmann        |

This species is identical with *Astyanax bimaculatus* in apparently all characters except the teeth. In *A. bimaculatus* the teeth of the inner series of the premaxillary are convex behind; the denticles correspond to this convexity and are, therefore, arranged in a curve. This curve varies from a crescent to U-shape in a specimen from Piracicaba. In *A. orthodus* the anterior and posterior surfaces of the teeth are similar, the denticles being arranged in nearly a straight line. These species differ, therefore, as *Micralestes* differs from *Myletes*.

Head 4; depth  $2\frac{2}{5}$ ; D. 11; A. 31-34 in Truando,<sup>3</sup> usually 30 in Patia Basin;<sup>4</sup> scales 7 or 8-37 to 41<sup>5</sup>-6 above ventrals, 8 above origin of anal; eye 3-3.3 in the head; interorbital  $2\frac{1}{2}$ .

Dorsal and ventral profiles equally curved, the ventral curve continuous, the dorsal profile very slightly concave over the eyes; maxillary distinctly longer than in a specimen of *A. bimaculatus* of the same size, longer than eye, a little less than 3 in the head; maxillary with one to four teeth. Width of cheeks equal to diameter of eye in the adult; limbs of preopercle forming about a right angle.

In the position of the dorsal, equidistant from tip of snout and base of upper caudal rays, and the position of the ventrals the specimens agree exactly with one of *A. bimaculatus* of equal size from Rio Grande do Sul. Pectorals reaching to ventrals or a little further; ventrals to or near to anal; anal basis convex; margin of anal nearly straight; adipose well developed. Predorsal line more fully scaled than in *A. bimaculatus*, the young frequently with a series of scales; the median scales in the adult more or less deeply notched, and frequently with a narrow margin bent over the ridge of the scales of one side.

A longitudinal oval, humeral spot; caudal spot sometimes continued to end of middle rays, usually confined to the scaled area at their base, some-

<sup>1</sup> To origin of the caudal.

<sup>2</sup> Largest specimen.

<sup>3</sup>  $\frac{31}{2}$ ,  $\frac{32}{2}$ ,  $\frac{33}{3}$ ,  $\frac{34}{1}$

<sup>4</sup>  $\frac{24}{1}$ ,  $\frac{30}{5}$

<sup>5</sup>  $\frac{37}{1}$ ,  $\frac{38}{6}$ ,  $\frac{39}{2}$ ,  $\frac{40}{1}$ ,  $\frac{41}{2}$  in the Truando,  $\frac{36}{2}$ ,  $\frac{37}{3}$ ,  $\frac{38}{1}$  in Barbacoas.



times (Patia Basin) occupying nearly the entire width of the peduncle; young frequently with dark lines following alternate septa between myotomes near to middle line.

Humeral spot sometimes with a light border in front and behind, obscured by a vertical band in the young.

24. *ASTYANAX* (*POECILURICHTHYS*) *POTAROENSIS* Eigenmann.

Plate 54, fig. 1.

*Astyanax potaroensis* EIGENMANN, Ann. Carnegie mus., 1909, 6, p. 22; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 433; Mem. Carnegie mus., 1912, 5, p. 361, pl. 7, fig. 5.

HABITAT.—Potaro River. Guiana.

*Specimens examined.*

| Catalogue number            | Number of specimens | Size in mm. | Locality                      | Collector |
|-----------------------------|---------------------|-------------|-------------------------------|-----------|
| 1037 C. Type                | 1                   | 58          | Amatuk Cataract, Potaro River | Eigenmann |
| 1038 C., 11733 I. Paratypes | 12                  | 51-64       |                               |           |
| 1039 C.                     | 1                   | about 59    | Kangaruma, Lower Potaro River | Shideler  |
| 1040 C.                     | 1                   | 45          | Tukeit, Lower Potaro River    | Eigenmann |
| 1041 C., 11734 I.           | 2                   | 47, 49      | Erukin, Lower Potaro River    | Eigenmann |

Evidently allied to *A. bimaculatus* and *A. orthodus*. It is readily distinguished from *A. bimaculatus* by its emarginate anal, the broad caudal band, and the absence of any stripe on the caudal peduncle. In the coloration of the sides it approaches *A. abramoides*, the humeral spot being less well defined, the black lateral line being absent. Its anal is distinctly shorter than that of *A. orthodus*.

Head 3.5; depth 2.6-3; D. 11; A. 27 or 28, rarely 29; scales 8 (rarely 9)-37 to 38<sup>1</sup>-6 or 7; eye 2.75; interorbital 3.

Elongate, subrhomboidal, profile rising rapidly in front, then curved more gently to the dorsal; ventral profile regularly rounded. Preventral area convex, without a distinct median series of scales; postventral area narrowly rounded. Predorsal area narrowly rounded, two scales in front of the dorsal, the median line otherwise naked to the occipital process.

<sup>1</sup> In ten specimens five have 37, three 38, one has 39 and one 41 scales.



Occipital process very narrow, its width not quite half its length which is about  $\frac{1}{5}$  as long as the distance from its base to the dorsal, bordered by three scales on the sides. Interorbital smooth and convex. Frontal fontanel a little narrower and a little shorter than the parietal. Second suborbital leaving a considerable naked area which is widest below. Mouth large. Maxillary a little longer than the eye. Normally four teeth in the outer series of the premaxillary of which the third is withdrawn from the line of the rest; five teeth in the second series. Maxillary with three small teeth. Mandible with four large teeth in the dentary and abruptly minute ones on the side.

Gill-rakers 6 + 14, those of the upper arch excessively minute, those of the lower arch about  $\frac{1}{3}$  the length of the eye.

Scales of the sides regularly imbricate, no interpolated scales over the anal; scales of the ventral surface less regularly imbricate.

Anal sheath composed of a single series of scales along the base of the anterior rays. Lateral line but little decurved.

Ventrals but little in advance of the vertical from the dorsal, which is a little nearer the snout than the caudal; highest dorsal ray about 4 in the length. Anal emarginate, the second and fourteenth rays reaching the base of the twentieth ray. Ventrals not reaching anal. Pectorals just to ventrals.

Coloration much as in *A. abramoides*, a dark bar crossing opercle, a second bar some distance behind this in a light area, the second bar widest above the lateral line where it forms an indistinct humeral spot; a third bar shading into the thickly dotted sides; cheeks thickly punctate, a dark dorsal streak. A black band crossing the base of the caudal and sometimes extending out along the outer rays. No dark line along the sides in formalin specimens, sometimes dark streaks up and down from the median line between segments of muscle.

## 25. ASTYANAX (ZYGOGASTER) STILBE (Cope).

Plate 43, fig. 3.

*Tetragonopterus stilbe* COPE, Proc. Amer. philos. soc., 1870, **11**, p. 559 (Para); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 54; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 275.  
*Astyanax stilbe* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 431, fig. 34 (Para); EIGENMANN & OGLE, Proc. U. S. N. M., 1907, **33**, p. 28 (Para); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 433.

HABITAT: Para and Atrato Basin.



*Specimens examined.*

| Catalogue number  | Number of specimens | Size in mm.             | Locality         | Collector      |
|-------------------|---------------------|-------------------------|------------------|----------------|
| 4919 C., 12757 I. | 55                  |                         | Boca de Certegui | Eigenmann      |
| 4920 C., 12756 I. | 40                  | 140 <sup>1</sup>        | Quibdo           | Eigenmann      |
| 5390 C., 13083 I. | 6                   |                         | Certegui         | Wilson         |
| 5388 C., 13081 I. | 1                   |                         | Quibdo           | Wilson         |
| 6695 C., 13581 I. | ∞                   | 100 <sup>1</sup>        | Truando          | Wilson         |
| 34589 U.          | 3                   | 47, 56, 67 <sup>1</sup> | Para             | J. C. Brevoort |

*Astyanax stilbe*, *A. caucanus*, and *A. atratoensis* are certainly closely related if not synonymous.

The following description is based on three specimens 34589 U. S. N. M. from the type-locality. The two larger specimens are more elongate but otherwise very similar to the smaller. In the following description the statements in brackets refer to the smaller specimen only.

Head about 3.75 (3.6); depth 2.66 (2.4); D. 11; A. 40 (36); scales 8-40-7 (8-40-8 to ventrals); eye 2.6-2.66 in the head, 2 in the head less opercle, a little longer than interorbital.

Compressed, profiles symmetrically curved. Predorsal and preventral areas bluntly keeled, the mid-line of the former naked to near the dorsal, a few median scales near the dorsal, otherwise the scales of the two sides approaching and sometimes overlapping the middle line.

Occipital process about 3 in the distance to the dorsal. Fontanels large, the frontal about 1.33 in the parietal without the groove. Second suborbital leaving a distinct naked border which is a little narrower below. Maxillary-premaxillary border equals the eye. Four teeth in the outer series of the premaxillary, five in the inner. Maxillary with one tooth. Mandible with five graduated teeth, the last one quite small, and about 5 minute subconical teeth. Denticles of the second series of premaxillary teeth in a crescent.

Gill-rakers 10 + 17.

Origin of dorsal nearer snout than caudal; margin of dorsal obliquely truncate, its highest ray about equal to the length of the head. Origin of anal on or a little behind the vertical from the last dorsal ray. Ventrals reaching anal in the two larger. Pectorals reaching three or four scales beyond origin of ventrals.

Scales regularly imbricate except over the anal where the rows are deflected

<sup>1</sup> To base of caudal.



towards the anal; a few diverging radials. Lateral line decurved; a row of scales along the base of the anterior part of the anal.

A conspicuous round humeral spot over the third and fourth scales of the lateral line; a spot at the base of the caudal.

This species is abundant in the Atrato in which the following number of scales were observed in the lateral line:  $\frac{3.9}{2}$ ,  $\frac{4.0}{17}$ ,  $\frac{4.1}{3}$  and the following number of anal rays  $\frac{3.6}{1}$ ,  $\frac{3.7}{1}$ ,  $\frac{3.8}{6}$ ,  $\frac{3.9}{6}$ ,  $\frac{4.0}{7}$ .

The outer ventral rays in the male are sometimes filiform and the anal is sometimes distinctly falcate, the third and fourth rays forming a narrow lobe, the fifth to eighth rays decreasing rapidly in height.

This species is replaced by *A. caucanus* in the Magdalena Basin, which differs only in having the second suborbital in contact with the lower limb of the preopercle along the entire length.

## 26. ASTYANAX (ZYGOGASTER) MAGDALENÆ Eigenmann and Henn.

*Astyanax magdalenæ* EIGENMANN & HENN, Ann. Carnegie mus., 1914, 7, p. 89.

HABITAT.—Magdalena Basin near Girardot.

### *Specimens examined.*

| Catalogue number  | Number of specimens | Size in mm. | Locality | Collector |
|-------------------|---------------------|-------------|----------|-----------|
| 5822 C. Type      | 1                   | 53          | Girardot | Eigenmann |
| 13611 I. Paratype | 1                   | 61          | Apulo    | Gonzales  |

Closely related to *A. stilbe* (Cope) differing in the greater depth, the shorter anal, and the lack of a median series of preventral scales.

Head 3.5–3.8; depth 2.33; D. 11; A. 33–34; scales 8–36 or 37–7 (to ventrals), snout 1.3 in eye, 4–4.5 in head; eye 3–3.3 in head and equal to interorbital.

Dorsal and ventral profiles equally and strongly arched. Predorsal area without a median series of scales, those of the two sides overlapping, an occasional median scale near the origin of the dorsal. Preventral area keeled, scales of the two sides apposed in the mid-line.

Interorbital convex, smooth; occipital process elongate, sharp, about one fourth of the distance from its base to the dorsal, bordered by three large scales. Frontal fontanel bluntly triangular, as wide as the parietal and about two thirds as long as the parietal without the occipital groove. Second and



third suborbitals leaving a narrow naked margin behind and below. Maxillary as long as the eye, shorter than the mandible, which is equal to the snout and half the length of the eye. Premaxillary with four broadly tricuspid teeth in the outer row and five brown-tipped 4- to 5-pointed teeth in the inner row. Maxillary with a single minute tooth in the upper angle. Mandible with five sharp 3- to 4-pointed teeth.

Origin of dorsal about equidistant from the snout and the base of the caudal, or slightly nearer the snout, its anterior rays 3.4 in the length. Caudal sharp, lobes equal and as long as the head. Anal not emarginate, short, its longest ray equalling length of ventrals or the head without snout and half the eye. Origin of anal slightly in advance of vertical from last dorsal ray.

Scales regularly imbricate below the lateral line from above the ventrals, posteriorly they are deflected or decurrent to the anal.

Anal sheath, a single row of oblong scales decreasing in size progressively towards the last rays; a short axillary scale. Lateral line gently decurved throughout its length.

Silvery; a lateral streak of bright silver from operculum to caudal; a single round black humeral spot; a horizontally oval spot at the end of the caudal peduncle.

27. *ASTYANAX (ZYGOGASTER) ATRATOENSIS* Eigenmann.

Plate 43, fig. 2.

*Astyanax atratoensis* EIGENMANN, Proc. U. S. N. M., 1907, 33, p. 28, fig. 5 (Truando); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 433.

HABITAT.—Atrato Basin.

*Specimens examined.*

| Catalogue number   | Number of specimens | Size in mm.      | Locality          | Collector        |
|--------------------|---------------------|------------------|-------------------|------------------|
| 11488 I. Cotype    | 1                   | 105              | Truando, Colombia | Michler & Schott |
| 5389 C., 13082 I.  | ∞                   | 144 <sup>1</sup> | Truando, Colombia | Wilson           |
| 5391 C.            | ∞                   | 145 <sup>1</sup> | Quibdo            | Wilson           |
| 12756 I., 13084 I. | 13                  | 123              | Quibdo            | Eigenmann        |
| 12757 I., 13083 I. | 13                  | 145 <sup>1</sup> | Boca de Certegui  | Eigenmann        |

Head 3.66–4; depth 1.9–2.25, on an average, 2.1; D. 11; A. 37–40,  $\frac{37}{4}$ ,  $\frac{38}{13}$ ,  $\frac{39}{3}$ ,  $\frac{40}{1}$ ,  $\frac{42}{1}$ ; scales 8 or 9 —  $\frac{36}{1}$ ,  $\frac{37}{2}$ ,  $\frac{38}{16}$ ,  $\frac{39}{1}$ ,  $\frac{40}{1}$ ,  $\frac{42}{1}$  — 8 or 9 (to ventrals); eye 2.8–3 in the head; interorbital 2.25–2.66 in the head.



Much compressed, subrhomboidal, the dorsal profile being equally arched with the ventral, the anal basis being nearly parallel with the predorsal profile; profile slightly concave over the eye, nape not sharply convex as in *Tetragonopterus*. Preventral very narrowly rounded, with a nearly complete median series of scales; postventral area still more compressed without a median series of scales. Predorsal area keeled, with but a few median scales near the dorsal, then with the margins of the scales bent over the back and then naked toward the occipital process.

Occipital process narrow, nearly  $\frac{1}{3}$  of the distance from its base to the dorsal, bordered by 3 or 4 scales. Interorbital smooth and distinctly convex. Frontal fontanel extending to over the anterior margin of the pupil, not much shorter than the parietal without the occipital groove. Second suborbital leaving but a very narrow naked area behind, in contact with the preopercle below, sometimes a naked angle below the suture between the first and second suborbitals. Mouth moderate. The slender maxillary not quite equal to the eye in length, not extending much, if any, beyond the origin of eye. Premaxillary with four, rarely five, teeth in the outer row and five in the inner; inner surface of the inner teeth convex, the points being arranged in a curved line, the middle point distinctly largest. Maxillary with one small tooth. Dentary with four large, graduate teeth followed on the sides by abruptly smaller teeth.

Scales cycloid, with numerous striae, those of the back and above the pectorals regularly imbricate, those below the lateral line and beyond the pectoral with interpolated rows; in the type the first interpolated row is under the 12th scale of the lateral line and begins in the sixth series below the line; the second begins directly under the 16th scale; another under the 4th scale below the 17th scale of the lateral line, another under the second scale below the 19th of the lateral line, immediately under the 21st scale and others under the fifth scale below the 22d and 23rd scales of the lateral line; another immediately under the 24th scale, another below the sixth scale under the 25th of the lateral line, two others below the 2d scale under the 26th and 27th scales respectively, and the last immediately under the 28th, which extends obliquely back, reaching the posterior margin of the anal fin; axillary scale well developed; anterior part of anal sheath not distinctly demarked from the scales of the sides, low, of about 3 series scales in front, of one series behind. Lateral line but little decurved.

Dorsal over the 11th scale of the lateral line, origin of ventrals under the 9th; dorsal sharply pointed, the second and third rays sometimes slightly pro-



duced, 3.4-4 in the length; caudal deeply forked; the lower lobe distinctly the longer; anal basis long, the fourth ray longest, forming with the third and fifth rays a very narrow, produced lobe in the male, with its origin under the last dorsal ray, slightly nearer base of pectorals than to the end of the anal. Ventrals nearly or quite reaching anal. Pectorals beyond origin of ventrals by 2 scales.

Iridescent; a well-marked vertically oval humeral spot, forming part of a humeral bar, a light bar in front of it and another behind it; a silvery lateral band, a small caudal spot, not continued to the end of the middle rays although the middle rays are darker than the rest.

This species is very abundant in the Truando. Of the numerous other localities examined in which large numbers of related species were taken only Quibdo yielded specimens of this species. It is possible that one of Steindachner's specimens recorded as *A. caucanus* belongs here.

Two readily distinguishable varieties were taken in the Truando. In one the color-markings are strong, the iris has a dark area below the pupil and a larger one above it. In the others there is no pigment below the pupil which is smaller, the color is less intense but the tip of the ventrals and marginal half of the anal is sometimes quite dark. It is possible that the difference in the color is due to the contracted color-cells in the latter, and the expanded condition in the former.

## 28. ASTYANAX (ZYGOGASTER) CAUCANUS (Steindachner).

### Plate 43, fig. 1.

*Tetragonopterus caucanus* STEINDACHNER, Ichthyol. beitr., 1878, 8, p. 71 (Cauca); Denks. K. akad. wiss. Wien, 1880, 42, p. 20, pl. 7, fig. 2 (Cauca); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 273.

*Astyanax caucanus* FOWLER, Proc. Acad. nat. sci. Phil. 1906, p. 343 (Paramaribo); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 433.

HABITAT.—Lower Cauca and Magdalena Rivers, Colombia.

### *Specimens examined.*

| Catalogue number  | Number of specimens | Size in mm.      | Locality        | Collector |
|-------------------|---------------------|------------------|-----------------|-----------|
| 4926 C., 12761 I. | 60                  | 41-99            | Soplaviento     | Eigenmann |
| 4927 C., 12762 I. | 170                 | 170 <sup>1</sup> | Calamar         | Eigenmann |
| 4924 C., 12759 I. | 12                  | 36-80            | Calamar Cienega | Eigenmann |

<sup>1</sup> Largest specimen.



| Catalogue number  | Number of specimens | Size in mm.      | Locality            | Collector |
|-------------------|---------------------|------------------|---------------------|-----------|
| 4929 C., 12764 I. | 5                   | 49-70            | Near Puerto Wilches | Eigenmann |
| 4925 C., 12760 I. | 16                  | 53-88            | Below Buena Vista   | Eigenmann |
| 4921 C., 12765 I. | 30                  | 87 <sup>1</sup>  | Peñas Blancas       | Eigenmann |
| 12766 I.          | 7                   | 97 <sup>1</sup>  | Puerto del Rio      | Eigenmann |
| 12763 I.          | 1                   |                  | Honda               | Eigenmann |
| 4922 C., 12767 I. |                     | 107 <sup>1</sup> | Girardot            | Eigenmann |

Very abundant in the Magdalena from the coast as far as Honda or Girardot at least. It was not taken in the upper (3000 feet) part of the Cauca.

There is very little difference between *A. atratoensis* and *A. caucanus*; the latter is a little more slender on an average, and the head is comparatively a little shorter. The two species can very readily be distinguished at sight. It is very probable that *A. caucanus* should be placed in the synonymy of *A. stilbe*; they differ in the development of the second suborbital.

Head 4-4.33; depth 2.33-3, average 2.7; D. 11; A.  $\frac{3.6}{4}$ ,  $\frac{3.7}{6}$ ,  $\frac{3.8}{10}$ ,  $\frac{3.9}{8}$ ,  $\frac{4.0}{3}$ ,  $\frac{4.1}{1}$ ; scales 7 or 8 -  $\frac{3.6}{1}$ ,  $\frac{3.7}{1}$ ,  $\frac{3.8}{17}$ ,  $\frac{3.9}{6}$ ,  $\frac{4.0}{5}$ ,  $\frac{4.1}{3}$ ,  $\frac{4.2}{1}$  - 7 or 8.

## 29. ASTYANAX (ZYGOGASTER) FILIFERUS (Eigenmann).

Plate 51, fig. 2.

*Zygogaster filiferus* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 23 (Apulo).

HABITAT.—Central portion of Magdalena Basin.

### *Specimens examined.*

| Catalogue number  | Number of specimens | Size in mm.      | Locality | Collector |
|-------------------|---------------------|------------------|----------|-----------|
| 12847 I. Type     | 1                   | 110              | Apulo    | Gonzales  |
| 12768 I., 4923 C. | 125                 | 140 <sup>1</sup> | Apulo    | Gonzales  |

*Astyanax caucanus* seems to shade into this species at Apulo. All the specimens were preserved in formalin so a direct comparison with the alcoholic material from the Magdalena is not altogether satisfactory.

Males of *S. filiferus* are undoubtedly more slender than males of *A. caucanus*. The origin of the anal is nearer to the origin of the dorsal than to the base of the last anal ray. The depth in the males is 3 in the length, the depth in the females averages 2.5.

A. 38 or 39; scales in the lateral line 38 or 39.

The outer rays of the ventrals and the first dorsal ray are prolonged, filiform.

<sup>1</sup> Largest specimen.



So far as known, this character is found among other characins only in some specimens of *A. stilbe* from the Atrato and in some of the Cheirodontinae. The preventral surface in the male is very narrow, the scales of the two sides are straight edged below and joined by a series of narrow median scales.

Head 4.25; depth 3; D. 11; A. 38; scales 7-38-6; eye 1- in snout, 3+ in head; interorbital 2.9 in the head; depth of caudal peduncle equals its length or the length of the postorbital portion of the head.

Slender; ventral profile a nearly regular segment of a circle from the mandible to the end of the anal; dorsal profile a little less regular, less deeply arched. Preventral area narrow, rounded, with a narrow median series of scales; postventral area narrow. Predorsal area rounded, with about six median scales in front of the dorsal, and about six irregular scales farther forward.

Occipital process unusually long and slender, its length equal to nearly a third of the distance from its base to the dorsal. Interorbital very convex. Mouth terminal, snout pointed. Maxillary about .6 as long as eye; maxillary-premaxillary border equal to the eye in the length; greatest width of the second suborbital about two thirds of the length of the eye; five teeth in the front row of the premaxillary on one side, four on the other, five teeth in the inner series of the premaxillary. One tooth on the maxillary, four large teeth in the mandible in front, minute ones on the sides.

Scales regularly imbricate except over the anal muscles where they are much smaller and the rows are deflected toward the anal. Caudal naked, anal with a sheath of a single series of scales which are continuous with those above its base; axillary scale long; lowest row of scales of the sides with their ventral margin straight, those of the two sides nearly meeting in front of the ventrals; a narrow median series between them.

Origin of dorsal an orbital diameter nearer tip of snout than end of last scale of the lateral line, the second ray prolonged in a filament, 3.33 in the length. Caudal deeply forked, the lobes about 3.5 in the length. Anal low, but little emarginate, its origin equidistant from middle of eye and end of last scale of the lateral line, on the vertical from the last dorsal ray. Outer ventral ray prolonged, reaching to base of fifth anal ray. Pectorals reaching two scales beyond origin of ventrals.

Easily distinguished by the filiform dorsal and ventrals, the position of the dorsal; the five teeth in the inner series of the premaxillary and the peculiar scaling of the preventral and predorsal areas, as well as by the small scales covering the anal musculature.

The type is a male with retrorse hooks along the first ten anal rays.



*Key to the Species of the Subgenus Astyanax.*

- a. Scales 8 to 10-50 to 55-8 or 9; A. 22-25; frontal fontanel not much shorter than the parietal; one tooth on the maxillary.....30. *microlepis* Eigenmann.
- aa. Scales 8 or 9-43 to 45-7 or 8; A. 27; frontal fontanel 2.5 in the parietal; no maxillary teeth.
  - 31. *cordovae* (Günther).
- aaa. Lateral line rarely with more than 39 scales, 41 in some specimens of *A. fasciatus*, *A. gymnogenys*, *A. taeniatus*, and *A. scabripinnis*.
- b. Dark stripes between the rows of scales on the sides; a dark band along caudal peduncle continued to the end of the middle rays; A. 26-28; scales 6 or 7-34 to 38-5; depth 2.8.
  - 32. *lineatus* (Perugia).
- bb. No lateral stripes. Usually a silvery band.
- c. Second suborbital not covering entire cheek.
- d. Anal with 25 or more rays (*A. laticeps* 24-25; *A. eigenmanniorum* and *A. ruberrimus* 23-28; *A. fischeri* 23-29; *A. ribeirae* 23-27; *A. multidentis* 24-25).
- e. An elongate humeral spot.
  - f. Depth 3 in the length; pectorals not reaching ventrals. Scales 7-34 to 38-6. Scales in 14 rows. Dorsal fin behind the base of the ventrals. Maxillary with one tooth, extending a little beyond the anterior border of the eye to end of first suborbital; interorbital space much greater than the eye, very convex; eye 4 in head; head  $3\frac{1}{2}$ ; depth 3; A. 27 or 28. A humeral spot twice as long as high.
    - 33. *wappi* (Cuv. & Val.).
  - ff. A conspicuous projectile-shaped humeral spot, the blunt end forward. Depth 2.3-2.6; scales 6-34 or 35-5; A. 25 or 26; eye 2.7 in the head; interorbital 3-3.5.
    - 34. *mucronatus* Eigenmann.
- ee. Humeral spot diffuse, (or absent), vertically elongate.
  - g. Snout very blunt, rounded; maxillary more than 2 in the snout and eye.
    - h. Snout half as long as the eye; 5 teeth in the front row of the premaxillary; depth 2.4; eye 2.4; A. 28; scales 6-35-4.....35. *brevirhinus* Eigenmann.
    - hh. Snout more than half the length of the eye; 2 or 3 teeth in the front series of the premaxillary; a caudal band; depth 2.5-2.6; eye 2.5; A. 23-24; scales 5-35-4.
      - 36. *giton* Eigenmann.
  - gg. Snout more or less pointed, the mouth terminal.
    - i. No caudal spot; cheek narrowly naked.
      - j. A. 31; depth 2.4; scales 8-35-7; maxillary with 4 teeth; a diffuse humeral band.....37. *daguae* Eigenmann.—
      - jj. A. 30; depth 2.8; maxillary without teeth, a rounded humeral spot.
        - 38. *longior* (Cope).
      - jjj. A. 27 or 28; depth 2.8-3.2; maxillary with one small tooth.
        - 39. *marionae* Eigenmann.
    - ii. Caudal spot rounded, not continued to the end of the middle rays.
      - k. A. 23-28; eye 3 in the head, 1.2 in the interorbital; maxillary equals snout; depth 2.2-2.75; caudal spot conspicuous, across the entire caudal peduncle in the younger.....40. *ruberrimus*<sup>1</sup> Eigenmann.
      - kkk. A. 23-27; eye 2.75-3, equal to the interorbital or greater; scales 6 or 7-34 to 38-5 or 6; caudal spot at least as large as eye; depth 2.5-3.
        - 41. *ribeirae* Eigenmann.
    - iii. A black caudal band extending to the end of the middle rays.
      - l. Dorsal from nearly an orbital diameter to several nearer the snout than the base of the middle caudal rays.
        - m. Four or five teeth in the inner series of the premaxillary; no humeral spot; a band from above the origin of the anal obliquely to the end of the middle caudal ray and the three rays above it; depth 2.5; eye 3.5-3.7; maxillary with one tooth, a little longer than eye; A. 25-30; scales 8 or 9-40 or 41, 6 or 7....42. *metae* Eigenmann.

<sup>1</sup> Based on specimens from the Pacific slope of Colombia. Specimens from Panama have A. 23-29; eye 3-3.2, 1-1.25 in the interorbital; maxillary equals snout; caudal spot well defined, oval; scales 6 or 7-34 to 37-5 to 7; depth 2.66-3.



- mm.* Five teeth in the inner series of the premaxillary. No humeral spot; depth 2.5–2.75; eye 3.66–4 in the head; maxillary with 0–3 teeth, extending considerably beyond anterior margin of eye; a conspicuous black band on the caudal peduncle, becoming wedge shaped on the caudal. A. 29–31; scales 7 or 8–37 or 38–6.  
43. *maximus* (Steindachner).
- mmm.* Four teeth in the inner series of the premaxillary. A humeral spot. Postventral surface broadly rounded. (Central America).  
*n.* Depth 3.25; eye 3.25; interorbital 2.3; A. 27; scales 8–39–6.5; head broad, blunt, 5 in the length.....44. *regani* Meek.  
*nn.* Depth 2.6; eye 3+, interorbital 2.3; A. 26; scales 7–38–7.5.  
45. *albeolus* Eigenmann.
- ll.* Dorsal usually about equidistant from snout and caudal. Five teeth in the inner series of the premaxillary except sometimes in *A. rivularis*, *A. obscurus* and *A. aeneus*.  
*o.* Two to seven multicuspoid teeth in a rather compact row at the anterior half of the maxillary.  
*p.* Interorbital 2.4–3 in the head.  
46. *nicaraguensis* Eigenmann & Ogle.  
*pp.* Interorbital 3.33–3.5 in the head; 14–17 gill-rakers on the lower arch.....47. *angustifrons* (Regan).  
*oo.* One or two, rarely three, maxillary teeth.  
*q.* Depth of caudal peduncle usually more than half the length of the head; usually a single tooth in the maxillary. Depth 2.3–3.  
*r.* Scales below the lateral line in series parallel with it.  
*s.* Caudal band simple, median..48. *fasciatus* (Cuvier).  
*ss.* Caudal band median, a spur from its base extending downward.....49. *fasciatus heterurus* Eigenmann.  
*rr.* The series of scales below the lateral line deflected toward the anal by the interpolation of supplementary series.  
50. *fasciatus parahybae* Eigenmann.  
*qq.* Depth of caudal peduncle about half the length of the head; snout more or less pointed; maxillary 2 or less than 2 in the snout and eye; depth 2.75–3.33; eye 2.4–3 in the head, usually much greater than the interorbital; humeral spot not sharply defined.  
*t.* Occipital process more slender, maxillary a little longer, not so sharply contracted, with one or two narrower teeth.  
51. *fasciatus jequitinhonhae* (Steindachner).  
*tt.* Occipital process equal to the snout or shorter; maxillary shorter and broader, sharply contracted above, with a very broad tipped tooth, or two or three narrower ones...52. *fasciatus macrophthalmus* Regan.  
*qqq.* Depth of caudal peduncle usually less than half the length of the head; maxillary rarely with as many as three teeth; eye in adult 3 or more in the head, less than interorbital; humeral spot large and conspicuous; A. usually 25–29.  
53. *fasciatus aeneus* (Günther).
- dd.* Anal with 17–24 rays (see also exceptions under *d.* p. 271).  
*u.* Caudal spot continued on middle caudal rays to their tip.  
*v.* Depth 2.3–2.7; five teeth in the inner series of the premaxillary; snout usually pointed.  
*w.* Dentary with abruptly smaller teeth on the sides; depth of caudal peduncle scarcely half of the length of the head; 12–15 scales in front of the dorsal; A. usually 22–24.  
54. *mexicanus* (Filippi).



- ww.* Dentary teeth more or less graduated on the sides; depth of caudal peduncle more than  $\frac{1}{2}$  head, about 10 to 13 scales in front of the dorsal.
- x.* Usually 3 teeth in the front row of the premaxillary; A. 19-24; two maxillary teeth; scales 5 to 7-32 to 39-4 or 5.  
55. *taeniatus* Jenyns.
- [*xx.* Three or four teeth in the front row of the premaxillary; A. 21 or 22; one maxillary tooth; scales 6-41-6; second suborbital leaving a naked area but one third narrower than the bone.  
see *A. gymnogenys*, p. 274].
- xxx.* Usually 4 teeth in the front row of the premaxillary; A. 23-28; scales 33-36; one maxillary tooth.  
56. *eigenmanniorum* (Cope).
- [*xxxx.* Two or three teeth in the front row of the premaxillary; A. 23-24; scales 35. Snout more than half the length of the eye.  
see *A. gilon*, p. 271].
- vv.* Depth 2.6-3.6.
- y.* Head 3.75-4.25; snout slightly shorter than eye; head heavy; body deepest and heaviest over middle of pectorals.
- z.* Usually three teeth in the outer row of the premaxillary. Anal 17-23.  
57. *scabripinnis* (Jenyns).
- zz.* Usually four teeth in the outer row of the premaxillary; a round or oval humeral spot.  
58. *scabripinnis laticeps* (Cope).
- A.* A. 22-24; depth 2.75. Eye equals snout, 1.5 in the interorbital.  
59. *scabripinnis paranae* Eigenmann.
- AA.* A. 17-23; one to seven teeth in the maxillary; depth 2.6-3.66.  
60. *scabripinnis rivularis* (Lütken).
- yy.* Head 3.25-3.6; eye 3.3, snout and interorbital 3-3.33 in the head, in the adult the snout and interorbital greater than the eye; maxillary in old reaching to below middle of eye.  
61. *scabripinnis longirostris* (Steindachner).
- yyy.* Eye 3 or less than 3 in the head; body deepest at origin of dorsal; A. 21-26; lateral line 37-39; second suborbital covering  $\frac{3}{4}$  of the width of the cheek.  
62. *scabripinnis intermedius* Eigenmann.
- uu.* Caudal spot not continued to the tip of the middle rays.  
63. *rubropictus* (Berg).
- B.* A. 17 or 18; eye 3-3.5; interorbital 2.5; maxillary with four teeth; D. 9 or 10; scales 6-34 to 38-5.....63. *rubropictus* (Berg).
- BB.* A. 21-24; eye 2.75-3, equals interorbital; maxillary with three teeth; D. 11; scales 6-33 to 35-4.5; lateral line extending to the caudal but sometimes interrupted on the tail; caudal spot well defined, not equal to the eye; snout wedge-shaped.....64. *mutator* Eigenmann.
- uuu.* No caudal spot; second suborbital narrow, usually leaving nearly half or more than half of the cheek naked.



- C. Maxillary with one tooth; five teeth in the inner row of the premaxillary; depth 2.75; A. 21 or 22; lateral line 41. . . . . 65. *gymnogenys* Eigenmann.
- CC. Maxillary with five or six teeth; four teeth in the inner row of the premaxillary; middle point of the third mandibular tooth recurved, thorn-like; depth 2.6–2.75; A. 24. . . . . 66. *aurocaudatus* Eigenmann.
- CCC. Maxillary with three or four teeth; five teeth in the inner row of the premaxillary; depth 3.6; A. 22; isthmus abruptly constricted behind. . . . . 67. *paranahybae* Eigenmann.
- cc. Second suborbital covering entire cheek; 5 teeth in the inner series of the premaxillary. Dorsal equidistant from snout and caudal. (Small species approaching Bryconamericus, reaching a maximum length of 70 mm.).
- D. Caudal band continued to the end of the caudal.
- E. Maxillary with usually 5 teeth; depth 3.3; A. 24–25; lateral line 32–34. . . . . 68. *multidens* Eigenmann.
- EE. Maxillary with 3 teeth; depth 3.5–4; five large dentary teeth; A. 22–24; lateral line 36 or 37; caudal spot large. . . . . 69. *gracilior* Eigenmann.
- DD. Caudal spot if present not continued to the end of the middle rays.
- F. No humeral spot.
- G. A. 20; lateral line 32. . . . . 70. *paucidens* (Ulrey).
- GG. A. 22–24; lateral line 38. . . . . 71. *hasemani* Eigenmann.
- FF. A well-developed humeral band; teeth in the sides of the lower jaw minute.
- H. Depth 3.33. A. 20–22; frequently a minute caudal spot; adipose margined with black. . . . . 72. *essequibensis* Eigenmann.
- HH. Depth 2.6–3. . . . . 73. *guianensis* Eigenmann.
- HHH. A. 27–31; no caudal spot. . . . . 74. *guaporensis* Eigenmann.

### 30. *ASTYANAX MICROLEPIS* Eigenmann.

Plate 48, fig. 4.

*Astyanax microlepis* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 24.

HABITAT.—Upper Cauca Basin, Ecuador.

#### *Specimens examined.*

| Catalogue number            | Number of specimens | Size in mm.      | Locality         | Collector |
|-----------------------------|---------------------|------------------|------------------|-----------|
| 5001 C. Type                | 1                   | 88               | Piedra Moler     | Eigenmann |
| 5002 C., 12769 I. Paratypes | 4                   | 48–87            | Piedra Moler     | Eigenmann |
| 5003 C., 12770 I. Paratypes | ∞                   | 112 <sup>1</sup> | Cartago          | Eigenmann |
| 5004 C., 12771 I. Paratypes | 50                  | 108 <sup>1</sup> | Paila            | Eigenmann |
| 5005 C., 12772 I. Paratypes | 20                  | 99 <sup>1</sup>  | Cali             | Eigenmann |
| 5006 C., 12773 I. Paratypes | ∞                   |                  | Cauca, near Cali | Eigenmann |

Very similar to *Poecilurichthys caucanus* Steindachner, and *Astyanax fasciatus* Cuvier from which it differs in the number of scales.

Head 3.66; depth 2.8–3.2; D. 11; A. 22–25; scales 8 to 10–50 to 55–8 or 9; eye 3.33 in the head, interorbital 3.

Profile over eye depressed. Preventral area narrow, flattened, without

<sup>1</sup> Largest specimen.



a distinct median series of scales, about 17 scales in front of the ventrals; post-ventral area narrowly rounded. Predorsal area narrow, bluntly keeled, without a distinct median series of scales, about 13 scales in front of the dorsal.

Interorbital convex, smooth. Occipital process about one fourth of the length from its base to the dorsal, bordered by four or five scales along each side, usually a few small scales about its tip. Frontal fontanel narrow, triangular, not very much shorter than the parietal without its groove. Mouth small; snout pointed; second suborbital narrower than the eye, leaving a naked border around its entire margin. Maxillary not extending beyond origin of the eye; maxillary-premaxillary border angulated, equal to half the length of the head without the opercle, lower jaw short, comparatively weak. Four or five teeth in the outer row of the premaxillary, five in the inner, the lateral one minute; one tooth on the maxillary; five or six graduated teeth on the mandible in front and sometimes a few minute ones on the side.

Gill-rakers 7 + 12.

Origin of dorsal about equidistant from caudal and snout, its height 4-4.5 in the length; adipose well developed; caudal lobes 4-4.3 in the length. Origin of anal equidistant from caudal and origin or middle of pectoral. Depth of caudal peduncle 1.25-1.33 in its length. Ventrals small 1.5-1.66 in the length of the head, not reaching the anal. Pectorals reaching to or nearly to the ventrals, equal to head without snout or a little longer.

Scales very regularly imbricate, the rows not deflected toward the anal by interpolated rows; caudal naked; anal with a very narrow sheath, of one row of scales in front; a well-developed axillary scale. Lateral line but very little decurved.

A vertical humeral spot widest and most intense over the lateral line. A silvery lateral band, expanded at the end of the caudal peduncle; no spots or bands on the fins.

### 31. *ASTYANAX CORDOVAE* (Günther).

Plate 44, fig. 3.

*Tetragonopterus cordovae* GÜNTHER, Ann. mag. nat. hist., 1880, ser. 5, 6, p. 12 (Rio de Cordova); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 278; PERUGIA, Ann. Mus. civ. storia, nat. Genova, 1891, ser. 2a, 10, p. 43 (Jubibiri).  
*Astyanax cordovae* EVERMANN & KENDALL, Proc. U. S. N. M., 1906, 31, p. 82 (Rio Primero, Cordova).

HABITAT.—Western Argentina.

One specimen. 11093 I. 66 mm. to base of caudal. Rio Primero. Titcomb.



The types in the British Museum are shrunken. The three larger ones appear to be different from the five smaller, which may be *A. rutilus*. Günther's formula is certainly wrong. The scales are 8-45-6, 9-45-8, 9-43-8 in the three larger, which may be taken as the types of the species.

Head 3.75; depth 3; D. 11; A. 27; scales 8 or 9-43 to 45-7 or 8; eye 3.75; interorbital 2.6; snout about equal to the eye.

Elongate, but little compressed, deepest just behind axil; caudal peduncle deep, much compressed, its depth  $\frac{1}{3}$  of the greatest depth; ventral profile, from the origin of the pectorals to the anal, nearly straight; dorsal profile steepest to the tip of the occipital process. Preventral area broadly rounded; the scales of the median series very irregular, reduced in places to rudimentary little flaps; postventral area narrowly rounded. Predorsal area narrowly rounded; its scales regularly imbricate, there being a complete median series of scales.

Occipital process a little less than  $\frac{1}{4}$  of the distance of its base from the dorsal, bordered by four scales on each side. Interorbital broadly and evenly convex. Frontal fontanel very short,  $2\frac{1}{2}$  in the length of the posterior exclusive of the occipital groove, extending forward to above middle of eye. Second sub-orbital leaving a wide naked area all around its free border. Maxillary very oblique, equal to the eye. Mandible 2.5 in the head. Four teeth in the outer row of the premaxillary, five in the inner; teeth of the inner series very thick, the denticles arranged in a U-shaped series; four large, irregularly graduated teeth in the lower jaw. No maxillary teeth.

Gill-rakers 10 + 15, the longest not quite equal to pupil.

Scales regularly imbricate, except on the preventral area, the rows not deflected toward the anal; no auxiliary rows; lateral line but little decurved, the row of scales below it parallel with it; many concentric, few radial striae; caudal naked; anal sheath weak; axillary scale well developed.

Origin of dorsal one scale nearer tip of the snout than the ventrals, about midway of the length, penultimate ray but little less than half the length of the highest, which equals the length of the head. Anal scarcely emarginate, its origin one or two scales behind the base of the last dorsal ray. Ventrals not reaching anal. Pectoral not to ventrals.

Plumbeous, an ill-defined lateral band; a vertical humeral spot across the third and fourth scales of the lateral line; middle caudal rays dark.

Vertebrae 14 + 18.

Posterior air-bladder pointed, more than twice as long as the anterior, its diameter but little more than  $\frac{1}{4}$  of its length, regularly curved, without angular turns. Alimentary canal about equal to the total length.



## 32. ASTYANAX LINEATUS (Perugia).

## Plate 44, fig. 2.

*Tetragonopterus lineatus* PERUGIA, Ann. Mus. civ. storia nat. Genova, 1891, ser. 2a, **10**, p. 664 (Matto Grosso; Rio Paraguay); EIGENMANN, Proc. U. S. N. M., 1893, **16**, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 281; BOULENGER, Trans. Zool. soc. Lond., 1896, **14**, p. 35 (San Luis).  
*Astyanax bimaculatus lineatus* EIGENMANN, Ann. Carnegie mus., 1907, **4**, p. 137 (Sapucay).  
*Astyanax lineatus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 433.

HABITAT.—La Plata Basin.

*Specimens examined.*

| Catalogue number  | Number of specimens | Size in mm.         | Locality                         | Collector |
|-------------------|---------------------|---------------------|----------------------------------|-----------|
| 3292 C.           | 14                  | 75–116              | Sapucay                          | Haseman   |
| 3293 C.           | 2                   | 88, 114             | Urucum Mts., Corumba             | Haseman   |
| 5212 C.           | 2                   | 140 about           | Santa Cruz de la Sierra, Bolivia | Steinbach |
| 11520 I. Paratype | 1                   | 84                  | Villa Maria, Rio Paraguay        | Perugia   |
| 10240 I.          | 2                   | 33, 40 <sup>1</sup> | Sapucay                          | Anisits   |

This species is distinguished from all other members of the genus by the brown lines between the scales. It resembles in this respect *Moenkhausia latissimus* and *M. steindachneri* as well as *Hollandichthys* and *Pseudochalceus*. This is an instance in which the same color-pattern has appeared in five different species, belonging to as many genera and subgenera.

In the Annals of the Carnegie museum I expressed the opinion that this species is a variety of *A. bimaculatus*. Through the courtesy of Dr. Gestro of the Genoa Museum I have received one of the cotypes of Perugia. Later Mr. Haseman and Mr. Steinbach collected several specimens. These show it to be distinct from Paraguay specimens of *A. bimaculatus*, in which series of dots form obscure lines along the rows of scales. In this species there are definite lines between the rows of scales.

Head 3.8; depth 2.8; D. 11; A. 26–28; scales 6 to 7–38<sup>2</sup>–5; eye 3.33; interorbital 3.

Heavy forward, tapering from ventrals to a slender caudal peduncle whose depth is about 3 in the greatest depth. Preventral region rounded, with a series of small median scales; postventral narrowly rounded. Predorsal region rounded, with an almost complete median series of scales.

<sup>1</sup> To base of caudal.

<sup>2</sup> Perugia gives 34.



Occipital process about one fifth of distance from its base to the dorsal, bordered by 4 scales on the sides, of which the first is not larger than the succeeding one. Interorbital rounded. Frontal fontanel but half the length of the parietal. Second suborbital leaving a naked strip a fourth as wide as its greatest width around its entire margin. Maxillary not quite equal to the eye,  $3\frac{3}{4}$  in the head. Mandible  $2\frac{2}{3}$  in the head. Premaxillary with four teeth in an approximately straight line in the outer row, five teeth in the inner row. Maxillary with a single tooth. Lower jaw with four large teeth and some smaller ones on the side.

Gill-rakers 8 + 14.

Scales strictly cycloid, with several inconspicuous striae, everywhere very regularly imbricate, the exposed edges, at a maximum twice as high as wide; no interpolated scales or rows of scales. Anal sheath inconspicuous, of a single row of scales; axillary scale nearly as long as eye. Lateral line but little decurved, the rows of scales below it parallel with it.

Origin of dorsal in middle of body, its height 4 in the length. Origin of anal but little behind the vertical from the last dorsal ray. Anal but slightly emarginate, but its anterior rays nearly three times as long as the last; base of anal not equal to the distance from the dorsal to the tip of the adipose. Origin of ventrals below the vertical from the second scale in front of the dorsal, not quite reaching the anal. Pectorals reaching beyond origin of ventrals.

A dark, vertical humeral spot crossing the third and fourth scales of the lateral line, followed and preceded by a light area; back dark, sides and below light metallic silvery, a series of dark stripes between successive rows of scales most conspicuous along the middle of the sides; a dark band along the caudal peduncle, narrowed and continued on the middle rays; sides of head dotted.

### 33. ASTYANAX WAPPI (Cuvier and Valenciennes).

Plate 54, fig. 4.

*Tetragonopterus wappi* CUVIER & VALENCIENNES, Hist. nat. poissons, 1848, **22**, p. 153 (Guiana); GÜNTHER, Cat. fishes Brit. mus., 1864, **5**, p. 326 (British Guiana); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 278.

*Astyanax wappi* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 433; Mem. Carnegie mus., 1912, **5**, p. 355, pl. 52, fig. 1.<sup>1</sup>

HABITAT.—British Guiana.

I have examined the type (2336 Museum hist. nat. Paris) total length 105 mm. and the specimen in the British Museum.

Head 3.66; depth 3; scales 7–38–6; eye 1.5 in the very convex interorbital,

<sup>1</sup> The figure is taken from the specimen in the British Museum.



1 in the snout, 4 in the head; A. 27; maxillary with one tooth; dorsal and anal profile about equally (?) arched; second preorbital striate; a large, oval humeral spot, twice as long as high; a dark caudal spot extending forward on the sides; trace of longitudinal streaks between the rows of scales.

### 34. *ASTYANAX MUCRONATUS* Eigenmann.

Plate 53, fig. 1.

*Astyanax mucronatus* EIGENMANN, Ann. Carnegie mus., 1909, 6, p. 19; Repts. Princeton. univ. exped. Patagonia, 1910, 3, p. 433; Mem. Carnegie mus., 1912, 5, p. 354, pl. 51, fig. 4.

HABITAT.— Lower Potaro River, Guiana.

#### *Specimens examined.*

| Catalogue number            | Number of specimens | Size in mm. | Locality                   | Collector |
|-----------------------------|---------------------|-------------|----------------------------|-----------|
| 1025 C. Type                | 1                   | 53          | Tumatumari above the Falls | Eigenmann |
| 1026 C., 11725 I. Paratypes | 3                   | 51–54       | Tumatumari above the Falls | Eigenmann |
| 1027 C., 11726 I. Paratypes | 14                  | 46–73       | Potaro at Tukeit           | Eigenmann |

Head 3.6; depth 2.3–2.6; D. 11; A. 25–26, rarely 27; scales 6–34 or 35–5 (rarely 4); eye 2.7, 2 in the head without the opercle; interorbital 3–3.5 in the head.

Compressed, subrhomboidal, with heavy head and slender caudal peduncle. Dorsal profile slightly depressed over the eye, rising with a gentle curve to the origin of the dorsal, abruptly descending to the end of the dorsal and then with a more gentle slope to the caudal peduncle. Ventral profile more regularly arched. Preventral region broadly rounded, postventral area more narrowly rounded. Predorsal area keeled, with a median series of 8 scales.

Occipital crest exceptionally narrow at the base, about one fourth of the distance from its base to the dorsal, bordered by 3 scales on the sides; skull narrow, slightly convex, smooth. Fontanels very narrow and long, the frontal fontanel as long as the parietal. Second suborbital leaving but a very narrow naked area. Maxillary but little longer than snout, 3.3 in the head. Pre-maxillary with two or three teeth in the front series, five teeth in the second series, their denticles in a straight line; two teeth on the maxillary; lower jaw with eight teeth arranged in a crescent four on each side, smaller teeth on the sides.

Gill-rakers 5 + 10.

Scales very regularly imbricate, without interpolated or omitted rows, each scale with several, slightly diverging striae; anal sheath of a single row of scales along the base of the anterior rays; caudal naked.



Origin of dorsal nearer snout than to caudal, 3.4 in the length. Anal emarginate, its origin about equidistant from snout with the 8th dorsal ray. Ventrals reaching anal, their origin a little in advance of that of the dorsal; *innominate bones protruding as spines in front*. Pectorals reaching beyond origin of ventrals.

A conspicuous bullet-shaped humeral spot, the blind end forward, a faint dark streak extending down from it; a diffuse caudal spot occupying the entire width of the end of the caudal peduncle. Dorsal line dark, sides profusely covered with pigment-cells disappearing on the belly; cheeks and opercles dotted; fins dotted, upper and lower margin of caudal dark. Straw colored in life, bases of dorsal, anal, and caudal lobes ochreous.

### 35. ASTYANAX BREVIRHINUS Eigenmann.

Plate 47, fig. 2.

*Astyanax brevirhinus* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 96; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432.

HABITAT.—Rio Jequitinhonha, eastern Brazil.

One specimen. 20905 Type. About 68 mm. Rio Jequitinhonha. Hartt and Copeland.

Distinguished by its blunt snout.

Head  $3\frac{5}{7}$ ; depth 2.4; D. 11; A. 28; scales 6–35–4; eye 2.5; interorbital 3.

Compressed, dorsal and ventral profiles equally arched, the former rising to the first dorsal ray. Preventral area rounded, without a complete median series of scales; postventral area narrowly compressed. Predorsal area obscurely keeled, with a median series of about 10 scales.

Occipital process very slender,  $\frac{1}{8}$  of the distance from its base to the dorsal, bordered by  $2\frac{1}{2}$  scales on the sides. Interorbital convex. Fontanels narrow, of nearly equal width, the frontal fontanel  $1\frac{1}{3}$  in the parietal without the occipital groove, frontals not in contact in the middle. Mouth low; snout half as long as the eye, very blunt. Maxillary not quite half as long as snout and eye. Second interorbital leaving about  $\frac{1}{4}$  of the cheeks naked. Five teeth in the front row of the premaxillary, five teeth in the second row. A small tooth on the maxillaries, a second minute one on the right maxillary. Four larger teeth on the dentary and a number of smaller ones on the sides, not sharply separated from the larger ones.

Gill-rakers 6 + 10.



Scales cycloid, with several diverging striae, regularly imbricate, without interpolated scales.

Anal sheath inconspicuous, of a single series of scales on the anterior two thirds of the fin; a well-developed axillary scale. Lateral line but little decurved. Caudal sheath on the lobes half as long as the middle rays.

Origin of dorsal equidistant from snout and base of middle caudal rays, its penultimate ray about half as high as the highest, which is  $3\frac{1}{2}$  in the length. Anal emarginate, its origin under the middle of the dorsal. Ventrals reaching anal, their origin an orbital diameter nearer the upper lip than the dorsal. Pectorals reaching one or two scales beyond the origin of the ventrals.

A silvery lateral band, an obscure humeral spot; tips of middle caudal rays dark, the rest of the middle rays hyaline with traces of color, the caudal lobes opaque.

### 36. *ASTYANAX GITON* Eigenmann.

Plate 47, fig. 1.

*Astyanax giton* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 97; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432.

HABITAT.—Rio Parahyba, eastern Brazil.

Two specimens. 20936 Cotypes. About 68– about 78 mm. Rio Parahyba, Thayer Expedition.

These two specimens resemble *Astyanax taeniatus* with a blunt snout. The larger may be considered the type. They differ from *A. brevirohinus* in the color of the caudal and the shape of the occipital process.

Head 4; depth 2.5–2.6; D. 11; A. 23–24; scales 5–35–4; eye 2.5; inter-orbital 2.75–3.

Occipital process not nearly so narrow as in *A. brevirohinus*; snout a little more than half as long as the eye; two or three teeth in the front row of the premaxillary; two teeth on the maxillary.

Gill-rakers 8 + 12.

Caudal sheath on the lobes more than half the length of the middle rays.

Dorsal nearly 4 in the length. Origin of anal under posterior part of dorsal or behind the dorsal.

A prominent humeral spot crossing the third scale of the lateral line; a large spot at base of caudal continued to the tips of the middle rays. Otherwise as in *A. brevirohinus*.



37. *ASTYANAX DAGUAE* Eigenmann.

Plate 33, fig. 3.

*Astyanax daguae* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 23.*Tetragonopterus (Aequidens) fasslii* Steindachner, Denksch. K. akad. wiss. Wien, 1915, p. 48 (Western Colombia).

One specimen. 5052 C. Type. 58 mm. Dagua River at Cordova, Colombia. Eigenmann.

Head 3.75; depth 2.4; D. 11; A. 31; scales 8-35-7; eye 2.5; interorbital 3.

Premaxillary teeth four in the front row, five in the second row. Maxillary teeth 4. Mandibulary 5 and abruptly minute ones on the sides. Origin of anal under base of fourth dorsal ray.

Dorsal falcate, reaching to adipose. Pectorals reaching beyond origin of second third of ventrals. Ventrals to base of 8th anal ray; a faint, diffuse humeral band, a very narrow lateral band.

38. *ASTYANAX LONGIOR* (Cope).

Plate 69, figs. 3 and 4; Plate 85, fig. 2.

*Tetragonopterus longior* COPE, Proc. Amer. philos. soc., 1878, 7, p. 691 (Peruvian Amazon); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 278.

*Astyanax longior* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 341 (Moyabamba); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 433.

*Astyanax pectinatus* FOWLER (*non* Cope), *Loc. cit.*, fig. 29.

HABITAT.—Marañon Basin.

I am indebted to the authorities of the Academy of natural sciences of Philadelphia for the opportunity to examine one of the two known specimens of this species.

Length 79 mm.; depth about 29; width of body 9; head 21; D. 11; A. 30; eye 6 mm.; interorbital 7 mm.; maxillary 4.5 mm.; mandible 8 mm.

Elongate, compressed. Dorsal and ventral profiles equally curved, without humps or depressions. Predorsal area narrowly rounded, with a median, not quite regular series of 13 scales from the dorsal to the occipital process.

Occipital process  $\frac{1}{3}$  of the distance from its base to the dorsal, bordered by three scales on each side. Second suborbital leaving a narrow naked border. Maxillary rather short, its anterior margin arched. Snout pointed. Three teeth in the outer series of the premaxillary, the first opposite the middle of the



second tooth of the inner series; five teeth in the inner series, their denticles in a shallow crescent. Maxillary without teeth. Mandible with four graduated teeth arranged in a crescent, and four small conical teeth on the side.

Origin of dorsal exactly equidistant from tip of snout and base of caudal. Base of anal very little more than distance from dorsal to adipose. Origin of ventrals equidistant from tip of snout and tip of last anal ray, in advance of the dorsal.

The scales are mostly gone, a few below the dorsal have about eight divergent striae. Scales about 6-34-?.

A roundish, humeral spot above the 3rd-5th scale of the lateral line, surrounded by silvery, a dark cross shade behind the silver; a silvery band; no caudal spot.

### 39. *ASTYANAX MARIONAE* Eigenmann.

Plate 52, fig. 2.

*Astyanax marionae* EIGENMANN, Ann. Carnegie mus., 1911, 8, p. 175, pl. 7, fig. 3.

HABITAT.—Upper Paraguay Basin.

#### *Specimens examined.*

| Catalogue number  | Number of specimens | Size in mm. | Locality                         | Collector |
|-------------------|---------------------|-------------|----------------------------------|-----------|
| 3353 C. Type      | 1                   | 54          | 6 miles from San Luiz de Caceres | Haseman   |
| 3354 C. Paratypes | 4                   | 16-51       |                                  |           |
| 3355 C. Paratypes | 5                   | 43-50       | Corumba                          | Haseman   |

Head 3.5-3.75; depth 2.8-3.2; D. 11; A. 27 or 28; scales 7-35-5; eye 2.5; interorbital 3.

Slender, dorsal and anal profiles gently and equally curved. Ventral areas rounded. Preventral area without a distinct median series of scales. Predorsal area with about ten scales.

Occipital process about one fifth of the space between its base and the dorsal. Interorbital but slightly convex. Frontal fontanel but little shorter, but much narrower than the parietal. Second suborbital leaving a narrow naked margin. Maxillary slender, one half the length of the snout and eye. Four teeth in the front row of the premaxillary, five in the second row. Maxillary with one small tooth. Mandible with four large teeth in front and several abruptly minute ones in each dentary.

Gill-rakers 8 + 11.



Scales regularly imbricate, no interpolated rows. Lateral line somewhat decurved. Anal with a sheath of a single row of scales along the base of the anterior rays. Scales with a few faint radial striae.

Origin of dorsal about equidistant from snout and caudal, highest dorsal ray 4 in the length. Caudal lobes about 3.5 in the length. Origin of anal under last caudal ray. Ventrals vary, reaching the anal. Pectorals scarcely to the ventrals.

Highly iridescent silvery; a bright silvery lateral band, a faint humeral band, no caudal spot.

Differing from *A. guianensis* in the partially naked cheek, etc.

For Marion Durbin Ellis, collaborator in monographing the minute Tetra-gonopterinae.

#### 40. ASTYANAX RUBERRIMUS Eigenmann.<sup>1</sup>

Plate 44, fig. 1; Plate 49, figs. 2 and 3.

*Astyanax ruberrimus* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 25.

*Astyanax aeneus*? REGAN (*non* Günther), Ann. mag. nat. hist., 1913, ser. 8, 12, p. 465.

HABITAT.—Pacific slope of Colombia and both slopes of Panama.

<sup>1</sup> Since the account of *A. ruberrimus* was prepared Mr. S. F. Hildebrand has examined several thousand specimens of *Astyanax* collected in Panama on both the east and west slope. They came from the Chagres River of the Atlantic side and from both the Mamoré Basin and Tuyra Basin of the Pacific side. He has come to the conclusion that there are two species of *Astyanax* in the fresh-waters of Panama. One of these is the widely distributed *A. fasciatus* (Cuvier) which is abundant in the Atrato River of the Atlantic drainage of Colombia occurring in very small numbers in the head-waters of the San Juan of the Pacific side of Colombia. This species is the one described by Steindachner as *fischeri* and by Meek as *grandis* from the Mamoré Basin. The second species is the *ruberrimus* of the San Juan and other Pacific streams of Colombia. All of the specimens enumerated below belong to this second species but are more slender. They have the shape of *A. fasciatus* and the color of *ruberrimus*. In representing them I used the figures of *fischeri* published by Steindachner but modified the color-markings (pl. 49, fig. 2, 3). This was at a time when I supposed that but one species *A. fischeri* existed in the Mamoré and that the specimens enumerated belonged to that species. It would seem therefore that either the specimens enumerated below should be listed under *ruberrimus* or that they represent a variety without a name. The name *fischeri* is a synonym of *fasciatus*.

The specimens erroneously identified as *A. fischeri* are:—

| Catalogue number | Number of specimens | Size in mm. | Locality   | Collector    |
|------------------|---------------------|-------------|------------|--------------|
| 20686            | 7                   | 65–92       | Rio Obispo | Steindachner |
| 20687            | 8                   | 75–92       | Rio Obispo | Steindachner |
| 20688            | 40                  | 17–36       | Panama     | Steindachner |
| 11490 I.         | 3                   | 54–about 70 | Panama     | Bransford    |
| 11491 I.         | 2                   | 46, 63      | Panama     | Bransford    |

It is possible that some of the younger ones, (20688) in which the caudal spot is continued to the end of the middle caudal rays are in reality *A. fasciatus*.

Mr. S. F. Hildebrand, in his volume on the fishes of Panama records this species from a great variety of localities on both slopes of the Canal Zone and from the Mamoré and Tuyra Basins of the Pacific slope of Panama south of the Canal Zone.



*Specimens examined.*

| Catalogue number               | Number of specimens | Size in mm.      | Locality                               | Collector     |
|--------------------------------|---------------------|------------------|--|---------------|
| 4912 C. Type                   | 1                   | 107              | Istmina                                | Eigenmann     |
| 4913 C., 12751 I.<br>Paratypes | ∞                   | 113 <sup>1</sup> | Istmina                                | Eigenmann     |
| 4914 C., 12752 I.<br>Paratypes | 7                   | 113 <sup>1</sup> | Betw. Puerto Negria &<br>Istmina       | Eigenmann     |
| 4915 C., 12753 I.<br>Paratypes | ∞                   | 94 <sup>1</sup>  | Puerto Negria                          | Eigenmann     |
| 5093 C., 12851 I.              | 12                  | 69-93            | Cordova                                | Eigenmann     |
| 5394 C., 13087 I.              | 2                   | 125 <sup>2</sup> | Rio San Juan, mouth of Rio<br>Cacurupi | Henn          |
| 5395 C.                        | 1                   |                  | Rio Calima, near Boca del<br>Dineho    | Henn          |
| 5397 C., 13089 I.              | 5                   |                  | Rio San Juan, mouth of Rio<br>Manguido | Henn          |
| 5396 C., 13088 I.              | ∞                   |                  | Istmina                                | Wilson        |
| 5402 C., 13094 I.              | 13                  |                  | Rio Telembi; 8 m. above<br>Barbacoas   | Henn & Wilson |
| 5204 C., 13096 I.              | 3                   |                  | Rio Telembi                            | Henn & Wilson |
| 5399 C., 13091 I.              | 39                  |                  | Barbacoas                              | Henn & Wilson |
| 5401 C., 13093 I.              | 8                   |                  | Above Barbacoas                        | Henn & Wilson |
| 5403 C., 13095 I.              | 15                  |                  | Rio Telembi, San Lorenzo               | Henn & Wilson |
| 5400 C., 13092 I.              | 39                  |                  | Creek Altacar, Barbacoas               | Henn & Wilson |
| 5405 C., 13097 I.              |                     |                  | Patia, mouth of Rio Guaitara           | Henn          |
| 5406 C., 13098 I.              |                     |                  | Rio Magui                              | Henn          |
| 5407 C., 13099 I.              |                     |                  | Patia between Magui & Telembi          | Henn          |
| 5398 C., 13090 I.              | 27                  |                  | Tado                                   | Wilson        |

Head about 4; depth 2.2-2.75; D. 11; A. 23-28; scales 7-35 or 36-7; eye 3 in the head; interorbital 2.4-2.5.

Deep and robust; ventral profile a little more arched than the dorsal, and a little more regular. Preventral area broad, slightly flattened, with a median series of about 14 scales; postventral area rounded. Predorsal area keeled, with about 11 median scales.

Occipital crest about 4 in the distance from its base to the dorsal, bordered by three scales on each side. Interorbital smooth, convex. Frontal fontanel narrow, about half as long as the parietal without the groove. Naked margin around the free border of the second suborbital about one fourth as wide as the suborbital. Maxillary equals snout, 4 in the head. Four teeth in the outer

<sup>1</sup> Largest specimen.

<sup>2</sup> Larger specimen.



series of the premaxillary, five in the inner; one or two broad tipped maxillary teeth. Mandible with four large teeth and about seven small ones on the side.

Gill-rakers 7 + 11.

Scales cycloid, with numerous slightly diverging striae, regularly imbricate, except along the anal, where they are a little disarranged. Anal sheath very low, of a single series of scales. Lateral line but little decurved, the row of scales below it parallel with it; a large axillary scale.

Origin of dorsal equidistant from tip of snout and caudal or a little nearer the former, its anterior rays 3.4 in the length. Caudal about 3.5 in the length. Anal slightly emarginate, its highest ray equals length of head without snout, its origin behind the vertical from the last dorsal rays. In the young, ventrals reach anal, and pectorals the ventrals which they do not do in the adult.

A conspicuous black spot occupying the entire width of the caudal peduncle in the young, somewhat narrower in the adult, not continued on the middle rays; a faint vertical humeral spot. Base of dorsal yellow, shading into brick-red; middle of caudal yellow the rest brick-red; base of anal brick-red.

Several specimens from various places on the San Juan in the British Museum probably belong to this species. In the absence of material for comparison, they were not identified with certainty when they were referred to me a few years ago.

#### 41. *ASTYANAX RIBEIRAE* Eigenmann.

Plate 55, fig. 2.

*Astyanax ribeirae* EIGENMANN, Ann. Carnegie mus., 1911, 8, p. 177, pl. 8, fig. 2.

HABITAT.—Southeastern Brazil.

#### *Specimens examined.*

| Catalogue number  | Number of specimens | Size in mm.     | Locality | Collector |
|-------------------|---------------------|-----------------|----------|-----------|
| 3368 C. Type      | 1                   | 66              | Xiririca | Haseman   |
| 3369 C. Paratypes | 56                  | 26-82           | Morretes | Haseman   |
| 3370 C. Paratypes | 27                  | 26-50           | Iporanga | Haseman   |
| 3371 C. Paratypes | 8                   | 13-73           | Xiririca | Haseman   |
| 3372 C. Paratypes | 4                   | 61-75           | Xiririca | Haseman   |
| 3373 C.           | 11                  | 40 <sup>1</sup> | Iguape   | Haseman   |

<sup>1</sup> Largest specimen.



Head 4.25–4.2; depth 2.5–3; D. 10; A. 23–27<sup>1</sup>; scales 6 or 7–34 to 38<sup>2</sup>–5 or 6; eye 2.75–3 in the head, a little less than or equal to the interorbital.

Compressed, dorsal and ventral profiles equally arched. Snout blunt, profile slightly depressed over the eye. Preventral area rounded, without a regular median series of scales; postventral area narrowly rounded. Predorsal area inconspicuously keeled, with a median series of about ten scales.

Occipital process bordered by three scales on each side, one sixth of the distance from its base to the dorsal. Interorbital convex. Frontal fontanel much shorter than the posterior without the groove. Second suborbital leaving a naked area about one third as wide as the bone. Maxillary equal to the snout in length, its margin very convex. Premaxillary with three teeth in the front series, five 5-pointed teeth in the second. Maxillary with two teeth. Dentary with seven or eight graduated teeth.

Gill-rakers 8 + 14.

Scales regularly imbricate, no interpolated rows. Anal sheath of a few scales along the base of the anterior rays. Lateral line complete; each scale with several radial striae.

Origin of dorsal midway between tip of snout and base of upper caudal rays. Origin of anal below or behind the base of the last dorsal ray. Dorsal pointed, the highest ray 3.5–4 in the length. Anal emarginate. Caudal about 3.5 in the length. Origin of ventrals in front of the vertical from the origin of the dorsal. Ventrals not reaching anal. Pectorals not to ventrals.

Humeral spot large, on about six scales above the 3d–5th scales of the lateral line and with an extension toward the scapular process. Caudal spot large and well defined, covering the entire width of the caudal peduncle; bases of middle caudal rays included in the spot which does not extend to the ends of these rays. The specimens collected December 8th at Xiririca are much lighter, the markings less well defined.

This species is closely allied to *A. mutator* and *A. intermedius*.

#### 42. *ASTYANAX METAE* Eigenmann.

Plate 87, fig. 4.

*Astyanax metae* EIGENMANN, Indiana univ. studies, 1914, no. 19, p. 11; 1920, no. 44, p. 11 (Rio Castaño, Rio Bue, Rio Tiguirito, Rio Tuy, Rio Tapa Tapa (all near Caracas) Lake Valencia, Venezuela).

HABITAT.—Eastern slopes of the eastern Cordilleras of Colombia; Venezuela.

<sup>1</sup> One with 23, two with 24, nine with 25, two with 27.

<sup>2</sup> Three with 34, five with 35, three with 36, two with 38.



*Specimens examined.*

| Catalogue number   | Number of specimens | Size in mm.      | Locality                        | Collector |
|--------------------|---------------------|------------------|---------------------------------|-----------|
| 5457 C. Type       | 1                   | 130              | Rio Negro <sup>1</sup>          | Gonzales  |
| 5458 C., 13153 I.  | 6                   | 103-130          | Rio Negro <sup>1</sup>          | Gonzales  |
| Paratypes          |                     |                  |                                 |           |
| 13153 I.           | 4                   | largest 132      | Rio Negro <sup>1</sup>          | Gonzales  |
| 13265 I.           | 3                   | largest 135      | Quebrada Cramalote <sup>1</sup> | Gonzales  |
| 13790 I.           | 1                   | 83               | Cumaral <sup>2</sup>            | Maria     |
| 13782 I.           | 1                   | 112 <sup>3</sup> | Caño Carneceria <sup>2</sup>    | Maria     |
| 13371 I., 13264 I. | 20                  | largest 146      | Barrigon                        | Gonzales  |

Head 4+; depth about 2.5; D. 11; A. 29, 31, 25, 29, 28, 30, 30 in seven specimens taken at random. Scales 8-40-6, 9-40-6, 9-41-6, 8-40-6, 8-40-7 in five specimens. Eye 1 in snout, 3.5-3.7 in head, 1.3-1.5 in interorbital; depth of caudal peduncle 2 in head.

Compressed, rather heavy forward. Preventral area rounded, with small scales and without a distinct median series. Predorsal area bluntly keeled, with a median series of 10 or 11 scales.

Occipital process extending about one fourth of the distance to the dorsal, bordered by four scales on each side. Skull convex. Parietal fontanel about twice as long as the frontal. Second suborbital convex, leaving a naked area of equal width about its entire border, except below the angle in front where the naked space is a little wider. Premaxillary with four teeth in the outer series, four or five in the inner, when five the lateral one minute. Maxillary with a single tooth; maxillary a trifle longer than the eye. Each ramus of the mandible with four large teeth and a few similar minute ones on the side.

Gill-rakers slender, about a third as long as eye, 14 on the lower arch.

Origin of dorsal fully an orbital diameter nearer the eye than the caudal; highest ray of dorsal equal to the length of head or a little shorter. Adipose fin well developed; caudal lobes longer than the head. Origin of anal under base of last dorsal ray. Ventrals scarcely reaching anal, their origin slightly in advance of the vertical from the first dorsal ray. Pectorals reaching at least to the origin of the ventrals.

Lateral line but slightly decurved. Scales regularly imbricate except over the anal muscles and here the irregularity is slight. A sheath of a single row of scales along the anal. Base of caudal similarly sheathed; a large axillary scale.

<sup>1</sup> At Villavicencio, at the base of the Andes, east of Bogota.

<sup>2</sup> North of Villavicencio.

<sup>3</sup> To base of caudal.



Faint traces of lines following the scales. No humeral spot; a large dark band extending from the tips of the three rays above the middle of the caudal to their base, expanding on the caudal peduncle and downward and forward, fading out above the origin of anal.

Closely allied to *A. maximus*, differing from all other species in the oblique band on the tail.

#### 43. *ASTYANAX MAXIMUS* (Steindachner).

Plate 87, figs. 1-3.

*Tetragonopterus maximus* STEINDACHNER, Ichthyol. beitr., 1875, 4, p. 43, pl. 7 (Tullumayo; Monterico); 1876, 6, p. 6 (syn.); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 54; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 276; ?Perugia, Ann. Mus. civ. storia nat. Genova, 1897, ser. 2, 18, p. 25 (Alto Beni).

*Astyanax maximus* ?FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 342 (Peruvian Amazon); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432.

*Tetragonopterus alosa* GÜNTHER, Ann. mag. nat. hist., 1876, ser. 4, 17, p. 399 (Monterico, Peru).

*Tetragonopterus rutilus* STARKS (non Jenyns), Proc. U. S. N. M., 1906, 30, p. 777 (Rio Perené).

HABITAT.—Mountain streams of eastern Peru.

#### *Specimens examined.*

| Catalogue number | Number of specimens | Size in mm. | Locality                            | Collector             |
|------------------|---------------------|-------------|-------------------------------------|-----------------------|
| 13762 I.         | 1                   | 116         | Yahuarmayo, Peru                    | Purchase of Rosenberg |
| —— Field Mus.    | 12                  | 97-133      | Moyobamba, July, 1912               | Osgood & Anderson     |
| I                |                     |             | <i>R. Azupar, July, 1920. Allen</i> |                       |

I have examined one of the specimens mentioned by Fowler. It has the origin of the dorsal equidistant from the snout and the caudal, and I am in doubt whether it is *A. maximus*. It is very probably a form of *A. fasciatus*.

Head 4.5; depth 2.5; D. 11; A.  $\frac{28}{4}$ ,  $\frac{30}{3}$ ; scales 7 or 8-38 to 40-6; eye 3.3 in the head, 1.5 in interorbital. Depth of caudal peduncle 2 in the head.

Pectorals reaching ventrals or shorter, ventrals to anal or shorter.

A large, obscure, vertical humeral spot; faint dark stripes between two rows of scales. A large caudal spot, abruptly narrowed and continued to the end of the middle caudal rays; otherwise no oblique band above anal as in *metae*.

#### 44. *ASTYANAX REGANI* Meek.

Plate 61, fig. 3.

*Astyanax regani* MEEK, Field mus. Publications, 1909, 7, p. 207 (Las Cañas); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432.

*Astyanax globiceps* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432.

HABITAT.—Pacific slope of Panama, Costa Rica.



*Specimens examined.*

| Catalogue<br>number  | Number of<br>specimens | Size<br>in mm. | Locality                |
|----------------------|------------------------|----------------|-------------------------|
| 6257 Field Mus. Type | 1                      | 130+           | Las Cañas, Costa Rica   |
| 6023 Field Mus.      | 1                      | 103            | Pacific Slope of Panama |

I am indebted to the late Mr. Seth E. Meek for the privilege of examining these specimens.

Head 4.66; depth about 3.33; D. 11; A. 27; scales 8-39-6; eye 3.5; interorbital 2.5.

Elongate, heavy forward. The head short and blunt. Preventral area broadly rounded, without a median series of scales, postventral area *broadly rounded*. Predorsal area rounded, with a partially complete series of ten median scales.

Occipital process  $\frac{1}{3}$  the distance from the base of the occipital process to the dorsal, bordered by 3 scales on the side. Interorbital very convex. Frontal-fontanel one third as long as the parietal. Snout short and blunt. Maxillary not quite equal to length of eye. Second suborbital leaving a naked space equal to  $\frac{1}{3}$  its own width. Premaxillary with four teeth in each series. Maxillary with two teeth. Dentary with four large graduated teeth in front and several smaller ones similar to the last of the four larger on the sides.

Gill-rakers short, about 6 + 11.

Dorsal a little nearer snout than caudal, its height about  $\frac{1}{3}$  in the length. Caudal about equal to length of head. Origin of anal below the tip of the last dorsal ray. Ventrals below the second scale in front of the dorsal, reaching a little more than halfway to anal. Pectorals reaching  $\frac{2}{3}$  to ventrals.

Scales thin, cycloid, rather irregularly placed on the belly; no interpolated scales on the sides. An exceedingly low anal sheath. Caudal naked; a very short and broad axillary scale. Lateral line but little decurved.

Silvery, an obscure vertical humeral spot, a plumbeous lateral band; a caudal spot, middle caudal rays dark.

45. *ASTYANAX ALBEOLUS* Eigenmann.

## Plate 49, fig. 1.

*Astyanax oerstedii* MEEK (*non* Kröyer), Field mus. Publications, 1907, 7, p. 145, in part (Turrialba; Rio Siguire; Rio Machucha).

*Astyanax albeolus* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 97; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432.

HABITAT.—Costa Rica.



*Specimens examined.*

| Catalogue number | Number of specimens | Size in mm. | Locality                                |
|------------------|---------------------|-------------|---|
| 6241 Field Mus.  | 2                   | 116         | Rio Machucha, Costa Rica                |
| Type & Paratype  |                     |             |   |
| 6267 Field Mus.  | 3                   |             | Chitaria, E. slope Costa Rica           |
| 6361 Field Mus.  | 1                   |             | Siguares, E. slope D'Alfaro, Costa Rica |

Head 4.5; depth 2.66; D. 11; A. 26; scales 7-38-7; eye equals snout, 3.5 in the head; interorbital  $\frac{1}{2}$  the head behind the second nareal opening; second suborbital leaving one third of the cheek naked.

Snout rounded; postventral area broadly rounded, dorsal more than an orbital diameter nearer the snout than to the middle caudal rays; pectorals reaching within two scales of the ventrals.

A vertically oval humeral spot, the ventral prolongation scarcely evident, crossing the 3d and 4th scales of the lateral line. Dorsal whitish with very few chromatophores; anal lobe without chromatophores, the rest of the fin with a few; caudal spot extending to the end of the fin.

Very closely related to if not identical with *A. regani*.

The above description is based on the type.

The paratype in the Field Museum also 6241 has the eye 3 in the head, longer than the snout, the anal with 30 rays. The dorsal a little nearer the caudal than in the type, the second suborbital leaves a much narrower naked area than in the type.

46. *ASTYANAX NICARAGUENSIS* Eigenmann and Ogle.

Plate 66, figs. 5-7.

*Astyanax rutilus nicaraguensis* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, **33**, p. 23 (Nicaragua).

*Astyanax fasciatus nicaraguensis* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 433.

HABITAT.—Nicaragua.

*Specimens examined.*

| Catalogue number | Number of specimens | Size in mm. | Locality  | Collector |
|------------------|---------------------|-------------|-----------|-----------|
| 55653 U.         |                     |             | Nicaragua | Bransford |
| 11486 I.         | 4                   | 57-67 about | Nicaragua | Bransford |

Maxillary slender, having 2-8 teeth. In the latter case the teeth extending along more than half the length of the bone. Of thirty-five specimens, there



are nine with two teeth, two with three, five with four, five with five, five with six, five with seven, three with eight, and one with nine on the maxillary.

Three have twenty-seven anal rays, twelve twenty-eight, eight twenty-nine, ten thirty, three thirty-two; average twenty-nine.

It is possible that the specimens with numerous maxillary teeth are all males.

In general characters the specimens agree with the specimens of *A. aeneus*, and those with but two maxillary teeth are indistinguishable from them. The fact that such a large per cent of specimens have a large number of maxillary teeth entitles them to a separate name.

The Field Museum contains numerous specimens collected in Lake Nicaragua (S. E. Meek).

#### 47. ASTYANAX ANGUSTIFRONS (Regan).

*Tetragonopterus angustifrons* REGAN, Biologia Centrali Americana. Fishes, 1907, p. 172, pl. 26; fig. 5 (Mexico).

*Astyanax angustifrons* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 433.

HABITAT.—Some part of Mexico.

Head  $3\frac{2}{3}$ –4; depth 3; D. 11; A. 26–29; scales 7 or 8–34 to 38–6 or 7; eye 3 in head, interorbital  $3\frac{1}{3}$ – $3\frac{1}{2}$ .

Snout subconical,  $\frac{2}{3}$  as long as eye. Maxillary extending to the vertical from anterior edge of pupil; three to five maxillary teeth. Origin of dorsal behind ventrals, its longest ray  $\frac{3}{4}$  to  $\frac{4}{5}$  in the head; free edge of fin slightly convex. Anal slightly emarginate; Pectoral  $\frac{3}{4}$  the head, about reaching ventrals which extend nearly to anal; caudal peduncle longer than deep. Coloration as in *A. mexicanus*.

#### 48. ASTYANAX FASCIATUS (Cuvier).

Plate 45, fig. 1–7; Plate 49, fig. 2, 3; Plate 50, fig. 2; Plate 95, fig. 1.

*Chalceus fasciatus* CUVIER, Mem. Mus. hist. nat., 1819, 5, p. 352, [? pl. 26, fig. 2] (Brazil); SCHOMBURGK, Fishes Brit. Guiana, 1841, 1, p. 215 (Paduiri).

*Tetragonopterus fasciatus* CUVIER & VALENCIENNES, Hist. nat. poisson, 1848, 22, p. 149 (Rio San Francisco); GÜNTHER, Cat. fishes Brit. mus., 1864, 5, p. 322 (Brazil; ?West Ecuador; ?Rio Chisoy; ?Mexico; Guatemala); Ann. mag. nat. hist., 1880, ser. 5, 6, p. 12 (La Plata); PERUGIA, Ann. Mus. civ. storia nat. Genova, 1891, ser. 2, 10, p. 44 (Candelaria); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1893, 16, p. 55; EIGENMANN & KENNEDY, Proc. Acad. nat. sci. Phil., 1903, p. 521 (Arroyo Pypucu; Arroyo Chagalalina); BOULENGER, Boll. Mus. univ. Torino, 1897, 12, no. 279, p. 3 (Lesser); VAILLANT, ?Bull. Mus. hist. nat., 1897, 3, p. 221 (Chagres); 1899, 5, p. 155 (Rio Carnot).



- Astyanax fasciatus* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 346 (Para); EIGENMANN, Ann. Carnegie mus., 1907, 4, p. 131 (Asuncion; Villa Rica); Rept. Princeton univ. Exped. Patagonia, 1910, 3, p. 432.
- Tetragonopterus rutilus* JENYNS, Zool. Beagle. Fishes, 1842, p. 125, pl. 23, fig. 2 (Parana); STEINDACHNER, Ichthyol. notizen, 1869, 9, p. 10, pl. 2, fig. 2, 3 (Montevideo); HENSEL, Wieg. archiv., 1870, p. 80; STEINDACHNER, Süswf. südöstl. Bras., 1876, 3, p. 575, pl. 2, fig. 1, 2 (Rio Parahyba; Rio Doce; Montevideo; Rio de Janeiro; Rio Jequitinhonha; Xamapa, Mexico); Denksch. K. akad. wiss. Wien., 1880, 42, p. 22 (Cauca); BOULENGER, Proc. Zool. soc. Lond., 1887, p. 281 (Canelos); Ann. mag. nat. hist., 1887, ser. 5, 19, p. 173; EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 52; COPE, Proc. Amer. philos. soc., 1894, 33, p. 87 (Rio Grande do Sul); ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 280; PERUGIA, Ann. Mus. civ. storia nat. Genova, 1891, ser. 2, 10, p. 44 (Resistencia & Laguna Ibera; Candelaria; Buenos Aires); EIGENMANN, Ann. N. Y. acad. sci., 1894, 7, p. 633 (Rio Grande do Sul); Lahille, Rev. Mus. de la Plata, 1895, 6, p. 7 (Puertoviejo; Arroyo de Gato; Doña Flora; Dock Central; Isla Santiago; Punta Lara); BOULENGER, Boll. Mus. univ. Torino, 1897, 12, no. 279, p. 4 (Caiza; Mission de San Francisco; San Lorenzo), 1898, 13, p. 2 (Rio Peripa; Rio Zamora; Rio Santiago); EIGENMANN & NORRIS, Revista Mus. Paulista, 1900, 4, p. 357 (Taubaté; Rio Tieté).
- Astyanax rutilus* EVERMANN & KENDALL, Proc. U. S. N. M., 1906, 31, p. 82; FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 435 (Rio Grande do Sul); EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 19 (Cordova; Rio Tieté; Rio Grande, trib. of Parana; Rio Camaguam; Rio Grande do Sul; Piracicaba; Taubaté; Asuncion; Villa Rica; Arroyo Chagalalina; Bahia Negra; Para; Napo or Marañon; Truando; West coast Central America); RIBEIRO, Kosmos, 1908, no. 1 (Rebeira Baixa).
- Tetragonopterus taeniatus* CUVIER & VALENCIENNES (*non* Jenyns), Hist. nat. poissons, 1848, 22, p. 145 (Mana; Surinam).
- Tetragonopterus viejila* CUVIER & VALENCIENNES, Hist. nat. poissons, 1848, 22, p. (Lake Maracaibo).<sup>1</sup>
- Tetragonopterus scabripinnis* KNER (*non* Jenyns) Characinen, 1859, p. 39 (Xamapa, Mexico; Irisanga); GÜNTHER, Cat. fishes Brit. mus., 1864, 5, p. 323 (Bahia).
- Tetragonopterus aeneus* HENSEL (*non* Günther) Wieg. archiv., 1870, p. 87 (Southern Brazil).
- Astyanax carolinae* GILL, Proc. Acad. nat. sci. Phil., 1870, p. 92 (Napo or Marañon).<sup>2</sup>
- Tetragonopterus carolinae* EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 279.
- Tetragonopterus cuvieri* LÜTKEN, Overs. K. Dan. selsk. Forh., 1874, p. 131 (Rio San Francisco; Rio das Velhas and tributaries); LÜTKEN, Vidensk. selsk., 1875, 12, p. 210, pl. 5, fig. 12 (Rio das Velhas).
- Astyanax cuvieri* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 19 (Rio das Velhas).
- Tetragonopterus örstedii* LÜTKEN, Vidensk. medd. nat. for. Kjöb., 1874, p. 229 (Rio San Juan, Central America); ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 274.
- Astyanax rutilus oerstedii* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 22 (Nicaragua).
- Tetragonopterus panamensis* GILL (*non* Günther), Proc. Acad. nat. sci. Phil., 1876, p. 336 (Rio Frijoli); STEINDACHNER, Flüssf. Südamer., 1879, 1, p. 18, pl. 1, fig. 1, 2 (Rio Mamoré); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 52; 1893, 16, p. 55.
- Tetragonopterus fischeri* STEINDACHNER, Flüssf. Südamer., 1879, 1, p. 18 (Rio Mamoré, Panama).
- Astyanax fischeri* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 26 (Pacific slope of Panama; Rio Frijoli; Empire Station, Panama); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 434.
- Astyanax jequitinhonhae* EIGENMANN & NORRIS (*non* Steindachner), Revista Mus. Paulista, 1900, 4, p. 357 (Piracicaba).
- Tetragonopterus petenensis* GÜNTHER, Ann. mag. nat. hist., 1880, ser. 5, 6, p. 12 (*non* Günther 1864) (Rio Negro, Argentina).
- Tetragonopterus copei* ULREY, in part (*non* Steindachner), Ann. N. Y. acad. sci., 1895, 8, p. 282 (Brazil; Lower Amazon).
- Astyanax grandis* MEEK, Field mus. Publication, 1912, 10, p. 67 (Pacific coast streams of Panama).

<sup>1</sup> I examined the specimen, 8656, in the Jardin des Plantes. It is recorded as from Bresil Merid. Aug. St. Hilaire, Aout, 1822. Lat. line about 35; A. about 25. The specimen is stuffed and varnished and it is impossible to say what may have been its original proportions. Dorsal behind the ventrals. A caudal band to end of middle rays.

<sup>2</sup> Gill assigns the following characters to his *A. carolinae*: — Maxillary ceases in front of the vertical from the pupil and end of first suborbital. Dorsal considerably behind origin of ventrals; pectorals reaching beyond ventrals. Eye about equal to the slightly convex interorbital, 3 in the length of the head. Depth  $2\frac{3}{4}$ ; head  $3\frac{2}{3}$ ; A. 26; scales 6.5–37 or 38–5; a humeral spot.



HABITAT.—Buenos Aires to Mexico, in nearly all streams of the eastern slope from Para to the Napo; western Colombia and western Central America. Locally absent.

Steindachner (Ichthyol. notizen, 1869, 9, p. 8) states that the description of Cuvier and Valenciennes (Hist. nat. poissons, 22, p. 352) was not based on Cuvier's original specimens of *A. fasciatus* and that he secured three specimens from Montevideo which agreed in all respects with Cuvier's description.

Later Steindachner (Süsswf. südöstl. Bras., 1876, 3, p. 20) examined specimens from Rio Janeiro, Rio Parahyba, and Rio Jequitinhonha.

It is quite certain that the first mentioned three specimens are not identical with those recorded later. The figure, showing a blunt snout and the description of the teeth, especially the statement that the inner series of the premaxillary is composed of four teeth, leave no doubt whatever that the specimens mentioned by Steindachner in the Notizen are *Bryconamericus iheringii*. Nor are the later of Steindachner's specimens the *A. fasciatus* of Cuvier. Cuvier (Mem. Museum histoire naturelle, 1819, 5, p. 352-353, pl. 26, fig. 2), described two species as follows:—

#### SUR DEUX NOUVEUX CHALCEUS.

La première de ces espèces, que je nommerai *Chalceus opalinus*,\* \* \* Ce poisson est originaire des rivières du Brésil, d'où il a été envoyé avec beaucoup d'autres productions par M. Auguste de Saint-Hilaire.

La seconde espece que j'appellerai *Chalcée à bandes*, *Chalceus fasciatus*, a été rapportée du même pays par M. Delalande, employé de notre Muséum.

Sa couleur paroît avoir été roussâtre, avec deux bandes longitudinales noirâtres, dont la supérieure commence près de l'opercule par une grosse tache ronde de la même couleur, et se prolonge jusque sur le milieu de la caudale; l'inférieure se termine au-dessus de la fin de l'anale.

Mon individu n'a que 5 pouces de long; je lui trouve 4 dents à la première rangée de chaque intermaxillaire et autant à la seconde, mais plus larges. Celles des maxillaires sont imperceptibles. A la mâchoire inférieure il y en a 8 en avant, larges et dentelées comme celles du deuxième rang d'en haut, et ensuite de chaque côte 10 ou 12 très-petites. Les sous-orbitaires sont légèrement striées; les operclees sont lisses; les écailles sont de grandeur moyenne: j'en compte 40 sur la rangée moyenne, et environ 12 rangées. La ligne latérale est un peu au-dessous du milieu de la hauteur. Ses pores ne sont pas branchus. La dorsale est à peu près sur le milieu et un peu pointue. Elle a 11 ou 12 rayons. L'adipéuse est extrêmement petite. Les pectorales sont médiocres, pointues et de 13 à 14 rayons. Les ventraux sont petites, sous la dorsale, de 8 rayons. L'anale est longue, de 18 rayons, La caudale fourchue, de 24.

Cuvier & Valenciennes, Hist. nat. poissons, 22, p. 149, state:—

Les premiers exemplaires apportés à M. Cuvier viennent du Rio San Francisco, par M. de Saint-Hilaire.

I examined the only specimens marked *A. fasciatus* preserved in the Jardin des Plantes. They are 8653 and 8654, 87 mm., 110 mm., and 115 mm. long. These are labeled as having been sent by Saint-Hilaire from the Rio San Francisco, 1820, and are undoubtedly the specimens mentioned by Cuvier & Valen-



ciennes. It appeared that these specimens were received from another collector a year after the publication of the original description of *A. fasciatus*.

Dr. Pellegrin has kindly written me that the date 1820 does not preclude one of the specimens being the type, for it probably only indicates the date of registering. Also that the type of *Chalceus opalinus* credited in Cuvier's description to Saint-Hilaire, was, in reality collected by Delalande in Rio de Janeiro. There seems to be no doubt, therefore, that Cuvier inadvertently exchanged the names of the collectors of his *A. opalinus* and *A. fasciatus* and there is every reason to believe that one of the three specimens mentioned by Cuvier and Valenciennes served Cuvier as the type of *A. fasciatus*. His statement, that his specimen was but 5 inches long, can apply only to the largest of the three specimens.

These specimens are stuffed and lacquered so that none of the characters can be made out clearly but they are evidently the recently described *A. rutilus*, and not the short analed *fasciatus* of Steindachner.

This species, the most widely distributed of the characins, has been and is giving rise to a number of distinct forms by isolation in different rivers. Steindachner says, "Almost every river system possesses a peculiar variety of this species; according to age, sex, season; according to abundance or scarcity of food; according to the habitat in cool or clear mountain brooks or deeper stagnant waters the outlines of the body vary and in part also the number of horizontal rows of scales and of the anal rays."

Some of the forms have differentiated far enough to be universally considered as distinct species. Such are the *A. mexicanus* reaching the United States, and the *A. aeneus* of Central America; to these should probably be added *A. parahybae*. Of equal value are *A. scabripinnis* and *A. jenynsii* of southeastern Brazil. Aside from these there are a number of statistical forms such as can only be differentiated if a comparatively large number of specimens are examined in each locality. The Rio Novo for instance has a well-marked variety of this sort. In an examination of the material in the U. S. N. M. *A. nicaraguensis* from Lake Nicaragua was thus defined as another one of them, but at that time the southern varieties were not distinguished because there was not enough material from the southern localities. Whether we call these forms species, varieties or do not recognize them as worthy of name, the fact remains that different rivers are inhabited by individuals that in the aggregate differ from the individuals of another river — that we have here a series of species in the making as the result of segregation.



The following table (p. 297) shows the variation of the species in the number of anal rays and scales in the lateral line in different localities. The numbers in the different lines indicate the number of specimens from the particular locality possessing the character indicated at the head of the column.

In southeastern Brazil, *Astyanax fasciatus* is found associated in the same rivers with *A. taeniatus* and its variations and with *A. scabripinnis* and its varieties. While in any particular stream, it is comparatively easy to distinguish between them each undergoes so many modifications in different rivers that it is not possible to give a clear definition that will distinguish the species when specimens from all the rivers are considered. *Astyanax fasciatus* is a long analed, slender, sharp-snouted species that about Rio de Janeiro grades in the number of its anal rays and in its shape perfectly into *A. taeniatus* which on an average is a shorter analed, deeper, sharp-snouted species. South of Rio Janeiro it grades into *A. eigenmanniorum* the still deeper substitute of *A. taeniatus* of the northern rivers. *Astyanax taeniatus* in its turn grades into *A. scabripinnis*, a slender, short-analed, heavy-jawed species. The latter and its varieties are always readily distinguishable from *A. fasciatus*; but *A. taeniatus* may sometimes be taken for *A. scabripinnis* on the one hand, or for *A. fasciatus* on the other. Lütken figured both *A. scabripinnis* and *A. taeniatus* as his *A. scabripinnis rivularis*. Jenyns in the original descriptions of *A. taeniatus* and *A. scabripinnis* recognizes the former as an intermediate form.

The matter is complicated by the fact that different river systems have different varieties of the several species and by the fact that if we imagine *A. fasciatus*, *A. taeniatus*, and *A. scabripinnis* to form a triangle *A. intermedius* would occupy the center of it.

The maze was disentangled with the Thayer material. Three years later, after the Thayer material had been returned, the large collections of Haseman became available for study. This separate study has had its advantages and disadvantages. I confess that after three years I had to approach the question of the species practically *ab initio*. I think a reduction in the number of accepted species would have been justified. It is, however, always easier to confuse facts than to disentangle them and very few changes have been made in the conclusion first reached.



Table showing the number of specimens of the same species from different localities and of different species having the number of anal rays and the number of scales in the lateral line indicated in the top line.

|  | ANAL RAYS |    |    |    |    |    |    |    |    |    |    |    | LATERAL LINE |    |    |    |    |    |    |    |    |    |    |    |    |
|--|-----------|----|----|----|----|----|----|----|----|----|----|----|--------------|----|----|----|----|----|----|----|----|----|----|----|----|
|  | 17        | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29           | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 |
| 1. <i>fasciatus</i> and varieties                |           |    |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |    |    |    |
| Rio San Francisco . . . . .                      |           |    |    |    |    | 1  | 1  | 9  | 6  | 15 | 15 | 9  | 8            | 4  | 4  | 1  |    |    |    |    | 1  | 6  | 9  | 2  | 1  |
| Jequimlonha . . . . .                            |           |    |    |    |    |    |    |    | 1  | 5  | 12 | 19 | 7            | 2  | 1  |    |    |    | 1  | 6  | 12 | 3  |    |    |    |
| Rio Doce . . . . .                               |           |    |    |    |    |    |    |    |    | 1  | 3  | 4  | 4            |    |    |    |    |    |    |    |    |    |    |    |    |
| Rio Novo . . . . .                               |           |    |    |    |    |    |    |    | 2  | 6  | 18 | 5  | 7            |    |    |    |    |    | 3  | 13 | 13 | 4  |    |    |    |
| Parahyba . . . . .                               |           |    |    |    |    |    |    | 1  | 1  | 1  | 1  | 8  | 10           | 10 | 10 | 11 | 2  | 1  |    |    | 1  | 3  | 6  | 1  |    |
| La Plata & Uruguay . . . . .                     |           |    |    |    |    |    |    |    |    |    | 1  | 10 | 4            | 9  | 3  | 1  | 1  |    |    |    |    | 1  | 5  | 8  | 2  |
| Rio Grande do Sul . . . . .                      |           |    |    |    |    |    |    |    |    |    | 1  | 9  | 4            | 3  | 1  |    |    |    |    |    |    |    | 2  | 8  | 2  |
| Para . . . . .                                   |           |    |    |    |    |    |    |    |    |    |    | 2  | 2            | 2  |    |    |    |    |    |    |    | 1  | 1  | 1  |    |
| Truando . . . . .                                |           |    |    |    |    |    |    |    |    | 1  | 3  | 2  | 10           | 1  | 1  |    |    |    |    |    |    | 3  | 6  |    |    |
| Nicaragua . . . . .                              |           |    |    |    |    |    |    |    |    |    | 3  | 12 | 8            | 10 | 3  | 2  |    |    | 1  | 1  | 2  | 2  |    |    |    |
| 2. <i>nicaraguensis</i> . . . . .                |           |    |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |    |    |    |
| 3. <i>aeneus</i>                                 |           |    |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |    |    |    |
| Perez . . . . .                                  |           |    |    |    |    |    | 1  |    | 3  | 7  | 7  | 2  |              |    |    |    |    |    |    |    |    |    |    |    |    |
| Rio Managua . . . . .                            |           |    |    |    |    |    |    |    | 1  |    | 4  | 2  | 3            |    |    |    |    |    |    |    |    |    |    |    |    |
| Motagua . . . . .                                |           |    |    |    |    |    |    |    | 2  | 2  | 5  | 6  | 1            | 2  | 2  |    |    |    |    |    |    |    |    |    |    |
| El Hule . . . . .                                |           |    |    |    |    |    |    |    | 2  | 2  | 3  | 2  | 1            |    |    |    |    |    |    |    |    |    |    |    |    |
| 4. <i>mexicanus</i> . . . . .                    |           |    |    | 2  | 2  | 14 | 30 | 34 | 6  |    |    |    |              |    |    | 1  |    |    | 2  |    | 1  | 1  | 2  |    |    |
| 5. <i>macrophthalmus</i> . . . . .               |           |    |    |    |    |    |    | 1  |    | 1  | 1  | 1  | 2            |    |    |    |    |    |    |    |    |    |    |    |    |
| 6. <i>ciannaniorum</i> . . . . .                 |           |    | 1  | 1  | 10 | 7  | 12 | 10 | 20 | 14 | 5  | 2  | 1            | 1  |    |    |    |    | 2  | 3  | 4  | 3  |    |    |    |
| 7. <i>taeniatus</i> (Haseman coll.) . . . . .    |           |    |    |    |    | 1  | 6  | 1  | 2  | 3  |    | 8  |              |    |    |    |    |    |    |    |    |    |    |    |    |
| <i>taeniatus</i> (Thayer exped.) . . . . .       |           |    | 1  | 4  | 6  | 7  | 9  |    |    |    |    |    |              |    |    |    |    | 2  | 2  | 1  | 2  | 3  | 3  |    |    |
| 8. <i>reticularis</i> . . . . .                  |           |    |    | 4  | 16 | 18 | 9  |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |    |    |    |
| 9. <i>scabripinnis</i>                           |           |    |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |    |    |    |
| Parahyba . . . . .                               |           | 5  | 4  | 6  | 3  | 3  | 1  |    |    |    |    |    |              |    |    |    |    |    |    |    |    | 1  | 1  |    |    |
| Rio Janeiro . . . . .                            | 1         | 1  | 14 | 2  |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    | 6  | 9  | 2  |
| 10. <i>scabripinnis intermedius</i> <sup>1</sup> |           |    |    |    |    |    |    |    |    |    |    |    |              |    |    |    |    |    |    |    |    |    |    |    |    |
| Parahyba . . . . .                               |           |    |    |    | 1  | 4  | 3  | 3  |    |    |    |    |              |    |    |    |    |    |    |    |    |    |    |    |    |
| Mucuri . . . . .                                 |           |    |    |    |    |    | 3  | 11 | 2  | 1  |    |    |              |    |    |    |    |    |    |    |    |    |    |    |    |

<sup>1</sup> These numbers do not include the specimens collected by Haseman for the details of which see under this variety.



*Specimens examined.*

| Catalogue number | Number of specimens | Size in mm.               | Locality                           | Collector        |
|------------------|---------------------|---------------------------|------------------------------------|------------------|
| 20962            | 1                   | 86                        | Santa Anna                         | Don Pedro II     |
| 21039            | 3                   | 46-about 60               | Rio San Francisco                  | Allen & St. John |
| 21040            | 9 <sup>1</sup>      | 115-144                   | Rio San Francisco                  | Allen & St. John |
| 20912            | 1                   | 96 <sup>3</sup>           | Bahia                              | Hartt & Copeland |
| 20922, 20924     | 2 <sup>2</sup>      | 71-98 <sup>3</sup>        | Rio San Francisco, below the falls | Hartt            |
| 21030, 21031     | 2                   | 82 & 122                  | Bon Jardine                        | Allen & St. John |
| 21027            | 2                   | 129-137                   | Rio das Velhas                     | Allen & St. John |
| 21036            | 3                   | 97-115                    | Rio San Francisco                  | Allen & St. John |
| 21048            | 17                  | 90-124                    | Rio San Francisco                  | Williams         |
| 21049            | 5                   | about 38-65               | Rio San Francisco                  | Williams         |
| 21034            | many                | poor                      | Rio San Francisco                  | Allen & St. John |
| 21039            | 3                   | 47-59                     | Rio San Francisco                  | Allen & St. John |
| 21049            | 5                   | 40-70                     | Rio San Francisco                  | Williams         |
| 826              | 1                   | 138                       | Rosario                            | Brooks           |
| 836              | 3                   | 112-117                   | Buenos Aires                       | Brooks           |
| 9262 I., 9285 I. | 5                   | 87-99 <sup>3</sup>        | Piracicaba                         | von Ihering      |
| 11633 I.         | 4                   | 91-126                    | Piracicaba                         | von Ihering      |
| 20870            | 2                   | 133-140                   | Buenos Aires                       | Wheatland        |
| 11367 I.         | 2                   | 59-about 105 <sup>3</sup> | Buenos Aires                       | W. B. Scott      |
| 20898            | 1                   | about 117                 | Itabapuana                         | Hartt & Copeland |
| 2418             | 1 <sup>2</sup>      | 115                       | Rio Una                            | A. de Lacerda    |
| 21078            | 73                  | 81-125                    | Rio Novo                           | Thayer Exped.    |
| 20695            | 14                  | 126-170                   | Rio Grande do Sul                  | Dom Pedro II     |
| 847              | 18                  | 45-117                    | Uruguay River                      | Wyman            |
| 20913            | 5 <sup>4</sup>      | 56-67                     | Jacurpe and Posuca Rio             | Hartt & Copeland |
| 10296 I.         | 2                   | 29-32 <sup>3</sup>        | Villa Rica                         | Anisits          |
| 9998             | 1                   | 41 <sup>3</sup>           | Arroyo Chagalalina                 | Anisits          |
| 11487 I.         | 2                   | 103-135 <sup>3</sup>      | Truando                            | Michler & Schott |
| 11492 I.         | 3                   | 66-84 <sup>3</sup>        | Central America                    |                  |
| 20971            | 1                   | 140                       | Cudajas <sup>5</sup>               | Thayer Exped.    |
| 10787 I.         | 1                   |                           | Rio Camaguam, Rio Grande do Sul    | von Ihering      |
| 10788 I.         | 2 <sup>6</sup>      | 60-78                     | Tieté                              | von Ihering      |
| 4887 I.          | 12                  | 42-103                    | Rio Grande do Sul                  | von Ihering      |
| 10112 I.         | 1                   | 31                        | Arroyo Pypucu                      | Anisits          |
| 1000             | 1                   |                           | Puerto Suarez                      | Steinbach        |
| 20699            | 1                   | 56                        | Goyaz                              | Honorio          |
| 11634 I.         | 3                   | 99-110                    | Castro Est. Paraná                 | von Ihering      |

<sup>1</sup> Cuvieri.<sup>2</sup> 20924 and 2418 have two maxillary teeth.<sup>3</sup> To base of caudal.<sup>4</sup> All have 2 maxillary teeth, 3 teeth in front row of premaxillary, gill-rakers 5 + 11, depth 2.75; eye equals interorbital; A. 24, 25, 25, 26, 26.<sup>5</sup> A. 27; lateral line 46; a male.<sup>6</sup> Gill-rakers 5 + 11, 8 + 12.



Mr. Haseman collected the following specimens for the Carnegie Museum:—

| A. Rio San Francisco.                         |                     |                 |   |
|---|---------------------|-----------------|---|
| Catalogue number                              | Number of specimens | Size in mm.     | Locality                                |
| 3413  | 5                   | 88-108          | Penedo                                  |
| 3414  | 50                  | 39-75           | Penedo                                  |
| 3415  | 50                  | 48-102          | Joazeiro                                |
| 3416  | 6                   | 58-86           | Cidade da Barra                         |
| 3417  | 6                   | 36-71           | Januaria                                |
| 3418  | 6                   | 70-92           | Pirapora                                |
| B. Rio das Velhas                             |                     |                 |   |
| 3419  | 3                   | 67-97           | Rio das Velhas                          |
| 3420  | 1 <sup>1</sup>      | 61              | Sete Lagoas                             |
| C. Salitre Basin.                             |                     |                 |   |
| 3421  | 3                   | 42-44           | Rio Salitre                             |
| 3422  | 4                   | 40-58           | São Thomé                               |
| D. Lagoas near Barra                          |                     |                 |   |
| 3423  | 17                  | 60-75           | Lagoa Pereira                           |
| 3424  | 1                   | 77              | Lagoa de Porto                          |
| 3425  | 3 <sup>2</sup>      | 51-71           | Barreiras                               |
| E. Rio Grande Basin of the Rio San Francisco. |                     |                 |   |
| 3426  | 8                   | 18-82           | Rio Sapon                               |
| 3427  | 9                   | largest 70      | Santa Rita                              |
| F. Basin of the Rio Itapicurú.                |                     |                 |   |
| 3428  | 3                   | 48-73           | Rio Itapicurú, 6 miles north of Bom Fin |
| 3429  | 18                  | 26-120          | Queimadas                               |
| 3430  | 4                   | poor            | Rio Ipome                               |
| 3431  | 1                   | poor            | Rio Paguis, Baixa Grande                |
| 3432  | 1                   | 72 <sup>3</sup> | Rio Coite                               |
| 3433  | 1                   | 85              | Samaron                                 |
| 3434  | 5                   | 65-111          | Jacobina                                |
| G. Rio Catu.                                  |                     |                 |   |
| 3435  | 14                  | 31-84           | Alagoinhas                              |
| H. Rio Doce.                                  |                     |                 |   |
| 3436  | 30                  | 14-87           | Rio Doce                                |

<sup>1</sup> In all but the anal rays this specimen agrees with others referred to *intermedius*.

<sup>2</sup> One typical in shape, with anal rays 26; one deep. A. 25; one intermediate A. 28.

<sup>3</sup> To base of caudal.



## I. Rio Ribeira.

| Catalogue number | Number of specimens | Size in mm. | Locality |
|------------------|---------------------|-------------|----------|
| 3437             | 8                   | 57-104      | Iporanga |
| 3438             | 2                   | 101-108     | Xiririca |

## J. Eastern slope of Rio Grande do Sul.

|      |    |                         |              |
|------|----|-------------------------|--------------|
| 3439 | 90 | 40-63                   | Porto Alegre |
| 3440 | 12 | one 58 the rest 120-152 | Porto Alegre |
| 3441 | 3  | 60-97                   | Cachoeira    |
| 3442 | 13 | 41-92                   | Cacequy      |

## K. Parana Basin.

|      |                  |            |   |
|------|------------------|------------|---|
| 3445 | 2                | largest 52 | Bridge of Goyaz, Paranahyba                   |
| 3446 | 2 <sup>1</sup>   | 138-153    | Bon Jardin, Minas, Rio Grande below waterfall |
| 3447 | 33 <sup>2</sup>  | 33-124     | São João del Rei, Rio Grande                  |
| 3448 | 10 <sup>3</sup>  | 63-98      | Jaguara, Rio Grande                           |
| 3449 | 89 <sup>4</sup>  | 24-76      | Mogy das Cruzes                               |
| 3450 | 1                | 133        | Piracicaba                                    |
| 3451 | 118 <sup>5</sup> | largest 78 | Salto Avanhandava, above the fall             |
| 3452 | 24 <sup>6</sup>  | largest 68 | Salto Avanhandava                             |

## K. Uruguay Basin.

|      |    |        |                            |
|------|----|--------|----------------------------|
| 3443 | 42 | 20-103 | Uruguayana                 |
| 3444 | 3  | 89-110 | La Plata, Buenos Ayres     |
| 3321 | 3  |        | Buenos Aires, Rio da Prata |

## M. Paraguay Basin.

|      |   |            |           |
|------|---|------------|-----------|
| 3320 | 9 | largest 95 | Sapucay   |
| 3453 | 3 | 57-60      | Rio Jauru |

The following specimens from Colombia west of the eastern Cordilleras differ considerably in shape. Some specimens from Apulo and Quibdo have the depth equal to one third of the length. In other places they are always deeper, and most of the specimens from the localities mentioned are deeper. There are usually six scales between the dorsal and lateral line in the Upper Atrato, seven in the Magdalena and eight in the Upper Cauca. The pores number 38 or 39

<sup>1</sup> A. 34, 26. Lateral line 38.

<sup>2</sup> A.  $\frac{22}{1}$ ,  $\frac{23}{1}$ ,  $\frac{24}{3}$ ,  $\frac{62}{4}$ ,  $\frac{27}{2}$ .

<sup>3</sup> A.  $\frac{25}{1}$ ,  $\frac{26}{1}$ ,  $\frac{28}{2}$ .

<sup>4</sup> A.  $\frac{24}{6}$ ,  $\frac{25}{2}$ ,  $\frac{26}{1}$ ,  $\frac{27}{1}$ .

<sup>5</sup> Depth 2.3-3; A.  $\frac{26}{1}$ ,  $\frac{27}{2}$ ,  $\frac{28}{1}$ ,  $\frac{29}{2}$ ,  $\frac{31}{3}$ .

<sup>6</sup> Depth 2.4-3.25.



in the Upper Atrato, 36–37 (rarely 40) at Soplaviento and 39 to 41 in the Upper Cauca.

*Specimens examined.*

| Catalogue number      | Number of specimens | Size in mm. | Locality         | Collector |
|-----------------------|---------------------|-------------|------------------|-----------|
| 4899 a–z C., 12739 I. |                     | largest 68  | Quibdo           | Eigenmann |
| 4900 a–c C., 12740 I. | 6                   | largest 151 | Boca de Certegui | Eigenmann |
| 4901 a–b C., 12741 I. | 12                  | largest 164 | Raspadura        | Eigenmann |
| 4902 a–e C., 12742 I. | 40                  | largest 151 | Paila            | Eigenmann |
| 4903 a C.             | 1                   | 103         | Piedra Moler     | Eigenmann |
| 4904 a–d C., 12743 I. | 12                  |             | Cauca at Cali    | Eigenmann |
| 4905 a–e C., 12744 I. | 10                  | largest 123 | Cartago          | Eigenmann |
| 4906 a–j C., 12745 I. | 100                 | largest 112 | Soplaviento      | Eigenmann |
| 4907 a–b C.           | 2                   | 32 and 36   | Calamar          | Eigenmann |
| 12746 I.              | 1                   | 40          | Puerto Wilches   | Eigenmann |
| 4908 a C.             | 1                   | 44          | Puerto Berrio    | Eigenmann |
| 4909 a–j C., 12747 I. | 100                 | largest 79  | Peñas Blancas    | Eigenmann |
| 4910 a–r C., 12748 I. | 38                  | largest 46  | Honda            | Eigenmann |
| 4916 C., 12754 I.     | 50+                 | largest 90  | Girardot         | Eigenmann |
| 4911 a–o C., 12749 I. | 100+                | largest 97  | Bernal Creek     | Eigenmann |
| 12750 I.              | Several             | largest 95  | Apulo            | Gonzales  |
| 13036 I.              | 1                   |             | Manigru          | Wilson    |
| 5385 C., 13077 I.     | Several             |             | Truando          | Wilson    |
| 5386 C., 13078 I.     | Several             |             | Quibdo           | Wilson    |
| 5361 a–c C., 13037 I. | Several             | 75–170      | Certegui         | Wilson    |
| 5362 a C., 13038 I.   | 2                   | 80–92       | Condoto          | Wilson    |
| 5363 a–x C., 13039 I. | Several             | largest 128 | Raspadura        | Wilson    |

I have also had access to the specimens recorded by Meek and Hildebrand in their *Fishes of Panama*. They came from Rios Capeti, Cupe, Grande, Yape, Aruza, and Tuyra all of the Tuyra Basin; from Rios Calobre, Mamoré, El Capitan, Juan Diaz Abaco, and Marte Arnade.

I shall first describe typical specimens coming from the Rio San Francisco and the Parana Basin, calling attention to the local deviations later.

Head about 4.3; depth 2.6–3; D. 11; A. 25–34;<sup>1</sup> scales 7–34 to 41<sup>2</sup>–6 to 7; eye 2.5–3; interorbital slightly wider than the eye in the adult.

Nearly symmetrically elliptical, without humps or depressions; preventral area rounded, without a distinct median series of scales; postventral area narrowly keeled; predorsal area narrowly keeled or rounded, with a series of about 12 nearly regular median scales.

Occipital process  $\frac{1}{3}$  of the distance of its base from the dorsal, bordered by

<sup>1</sup> See tables for details.

<sup>2</sup> 46 scales in a specimen from Cudajas.



four scales on the side. Interorbital evenly rounded; frontal fontanel narrow,  $1\frac{1}{2}$  in the parietal fontanel; maxillary equal to the snout, much shorter than the eye; second suborbital rounded, leaving a considerable naked area all around, which is widest at the ends of the bone; four or five teeth in the front row of the premaxillary, five in the second; a single tooth in the maxillary, four large slightly graduate teeth and a number of small ones in each dentary.

Gill-rakers 8, 16, the longest a little more than  $\frac{1}{3}$  of the eye.

Scales thin, cycloid, somewhat caducous, those above the lateral line with 2-8 striae, regularly imbricate, no interpolated rows below the lateral line and but few extra scales at base of anal;<sup>1</sup> anal sheath low, of a single series of scales; caudal naked except just at the base; a large axillary scale; lateral line but little decurved, the scales below it parallel with it.

Origin of dorsal midway between tip of snout and base of upper caudal lobe, or a little nearer the former; origin of ventrals and third scale in front of the dorsal equidistant from tip of snout; origin of anal a little behind vertical from base of last dorsal ray; dorsal more than 4 in the length; anal slightly emarginate, its base equal to the distance from the base of the last dorsal ray to the origin or tip of the adipose; pectorals reaching ventrals; ventrals not to anal.

A silvery lateral band; a faint vertical humeral spot over the 3rd and 4th scales of the lateral line; the silvery band becoming black on the caudal peduncle and continued as a black streak to the end of the middle rays; anal hyaline, with minute chromatophores toward the ends of the membranes, its anterior ray and tips of a few succeeding ones milk-white.

Some specimens, 20875, probably from Lagoa Santa have a comparatively short and thick body; A. 25 and 26. Small specimens from Villa Rica, 10296 I, Arroyo Pypucu, 10112 I, and Arroyo Chagalalina, 9998 I, have no differentiated humeral spot, the chromatophores being evenly distributed.

In the larger of two specimens from Tieté (10788 I. ♂ 77 mm.) the scales are greatly striate (10-17 striae), the depth is 2.5; A. 23; scales 5-35-4 to base of ventral, 5 to anal; in the small (59 mm.), the scales have from 3-7 striae; depth 2.66; A. 25; scales 5-35-4 to base of ventral. Caudal nearly plain.

In specimens from the Rio Novo, 21078, the most frequent number of anal rays is 27 (25-29) instead of 32 in those from the Parahyba, and the most frequent number of scales in the lateral line is 35 or 36 with 5 between the lateral line and the ventrals, instead of 39 and 40 with 6 or 7 between it and the ventrals in *A. parahybae*.

<sup>1</sup> In two of the specimens from the Uruguay there are interpolated rows.



Depth 2.4-2.6. Gill-rakers 9.15.

There are no interpolated scales below the lateral line and the series are therefore not deflected toward the anal.

Margin of the anal and caudal and middle rays of the latter are dark, the dorsal largely speckled. There is either no milk-white tip to the anal or this spot, when it is rarely indicated is much smaller than in specimens from the Parahyba.

49. *ASTYANAX FASCIATUS HETERURUS* Eigenmann.

Plate 89, fig. 3.

*Astyanax heterurus* EIGENMANN, Indiana univ. studies, 1914, no. 19, p. 11.

HABITAT.—Truando River.

Two specimens 5392 C. Type about 50 mm. and 13085 I. paratype about 46 mm. Truando. Wilson.

Head 3.25; depth 3.25; eye 2.75 in the head, about equal to the interorbital.

Origin of dorsal equidistant from tip of snout and base of middle caudal rays; pectorals about equal to head without opercle, reaching past origin of ventrals; ventrals slightly beyond origin of anal; anal falcate, its highest ray reaching to the last fourth or fifth of the base of the fin.

A vertically elongate humeral spot; a small round spot on the end of the caudal peduncle; color of caudal unique for the genus. Middle caudal rays black to near their base, margins of the fin black, the lower wider and more conspicuous and connected with the black of the middle caudal rays by a short black bar across the base of the lower lobe.

This species, evidently very closely related to *A. fasciatus*, is readily distinguished by the peculiar color of the caudal.

50. *ASTYANAX FASCIATUS PARAHYBAE* Eigenmann.

Plate 46, fig. 7.

*Astyanax fasciatus parahybae* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 97; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 433.

HABITAT.—Parahyba, eastern Brazil.



*Specimens examined.*

| Catalogue number        | Number of specimens | Size in mm.          | Locality          | Collector         |
|-------------------------|---------------------|----------------------|-------------------|-------------------|
| 20635 Cotypes           | 27                  | 95-138 about         | Rio Parahyba      | Agassiz & Bourget |
| 27412                   | 2                   | 95 <sup>1</sup> -129 | Rio Parahyba      | Agassiz & Bourget |
| 20890                   | 4                   | 83-103               | Mendez            | Hartt & Copeland  |
| 20891                   | 2                   | 70-80                | Mendez            | Hartt & Copeland  |
| 20893 }<br>20894 part } | 3                   | 34-54                | Muriahe           | Hartt & Copeland  |
| 9268 I.                 | 1                   |                      | Taubaté           | Von Ihering       |
| 3357 C.                 | 73 <sup>2</sup>     | 40-85                | Campos            | Haseman           |
| 3358 C.                 | 20 <sup>3</sup>     | 38-64                | São João da Barra | Haseman           |
| 3359 C.                 | 4 <sup>4</sup>      | 55-79                | Lagoa Feia        | Haseman           |
| 3360 C.                 | 4 <sup>5</sup>      | 38-45                | Entre Rios        | Haseman           |
| 3361 C.                 | 2 <sup>6</sup>      | 76-82                | Jacarehy          | Haseman           |

The specimens from the Parahyba Basin differ from typical *A. fasciatus* in so many and so striking respects that they may also be distinguished by a varietal name.

Head 4.25-4.4; depth 2.5-2.66; D. 11; A. usually 31 or 32, (27-34); lateral line usually 39 or 40 (37-41); eye equals interorbital, less than 3 in the head; one maxillary tooth; 4 or 5 teeth in the outer row of the premaxillary in the ratio of 2:1.

Gill-rakers 9 + 16.

Rows of scales below the lateral line deflected towards the anal by interpolated rows of scales, the first of the interpolated rows beginning at a point above the middle of the ventrals and one or two rows of scales below the lateral line.

Tips of dorsal, caudal rays, and anal usually dark; tips of ventrals, more rarely dark; the tips of the pectorals also dusky; middle caudal rays dark; tips of first two rays of the anal milk-white.

51. *ASTYANAX FASCIATUS JEQUITINHONHAE* (Steindachner).

Plate 50, fig. 3.

*Tetragonopterus jequitinhonhae* STEINDACHNER, Süßwf. südöstl. Bras., 1876, 3, p. 27, pl. 2, fig. 3 (Jequitinhonha); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 52; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 280.

*Astyanax fasciatus jequitinhonha* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 432.

HABITAT.—Eastern Brazil.

<sup>1</sup> To base of caudal.

<sup>2</sup> A. 30, 30, 30, 32, 29, 29, 31, 29, 30.

<sup>3</sup> A. 31, 29, 30, 30.

<sup>4</sup> A. 30, 31, 28, 29.

<sup>5</sup> A. 25-27. Four others from this place are doubtful. They are small and the scales are lost.

<sup>6</sup> A. 28, 30.



*Specimens examined.*

| Catalogue number | Number of specimens | Size in mm. | Locality          | Collector        |
|------------------|---------------------|-------------|-------------------|------------------|
| 20916            | 20                  | 62          | Rio Arassuahy     | Hartt & Copeland |
| 20901            | 10                  | 55-92       | Rio Jequitinhonha | Hartt & Copeland |
| 20903            | 8                   | 69-89       | Rio Jequitinhonha | Hartt & Copeland |
| 20906            | 1                   | 95          | Rio Jequitinhonha | Hartt & Copeland |
| 20907            | 1                   | 79          | Rio Jequitinhonha | Hartt & Copeland |
| 20908            | 4                   | 36-60       | Rio Jequitinhonha | Hartt & Copeland |

As Steindachner has pointed out, the specimens from the Jequitinhonha are certainly slenderer than typical *A. fasciatus* from the Parana and Rio San Francisco, from which they also differ in the shorter lateral line.

Depth 2.75-3; D. 11; A. 25-30, most frequently 28; scales 6-34 to 37 (usually 36)-4 or 5 to the ventrals.

Gill-rakers 9 + 14, 9 + 13, 6 + 12, 7 + 13, 8 + 14, 8 + 13 in different specimens.

No interpolated rows of scales.

Fins hyaline or dusky; median caudal rays dark or rarely hyaline; tips of first two fully developed anal rays sometimes milky white.

To this variety should perhaps also be referred:—

ten specimens 20911, 65-115 mm. Rio Doce, between Linhares and Porto Souza. Hartt & Copeland, and two specimens 20883, 65-78 mm. São Matheos. Hartt & Copeland.

These specimens are in rather bad condition. They differ from *A. jequitinhonhae* in the increased number of gill-rakers (10 + 16 to 18, Rio Doce; 6 to 9 + 12-17, São Matheos). Head 4; depth 2.8-3 $\frac{1}{8}$ ; D. 11; A. 26-29; eye 2.5-3 in the head.

52. *ASTYANAX FASCIATUS MACROPHthalmus* Regan.

## Plate 49, fig. 6.

*Astyanax aeneus* MEEK (*non* Günther), Publication Field Columbian mus. zool., 1904, 5, p. 86 (in part) (Motzorongo).

*Astyanax rutilus* var. EIGENMANN & OGLE, Proc. U. S. N. M., 33, p. 23 (Mexico; Motzorongo; Vera Cruz).

*Astyanax macrophthalmus* REGAN, Biologia Centrali Americana, Fishes, 1908, p. 169, 171, pl. 26, fig. 4 (Motzorongo).

*Astyanax fasciatus macrophthalmus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 433.

HABITAT.—Southern Mexico.



*Specimens examined.*

| Catalogue number   | Number of specimens | Size in mm. | Locality   | Collector |
|--------------------|---------------------|-------------|------------|-----------|
| 43597 U.           | 2                   |             | Mexico     | Duges     |
| 44946 U.           | 1                   |             | Vera Cruz  | Herrera   |
| 11448 I., 10928 I. | 4                   | 71-81       | Motzorongo | Meek      |
| 11493 I.           | 2                   | 67-84       | Mexico     | Meek      |

Depth 2.75-3; A. 26-31; scales 7 or 8-37 or 38-5 to the ventrals; eye 2.75.

In one the interorbital is distinctly less than the diameter of the eye, in the other just equal to it; the maxillary about equal to the eye; the pectorals extend a little beyond the origin of the ventrals.

A caudal band and a humeral spot.

53. *ASTYANAX FASCIATUS AENEUS* (Günther).

- Tetragonopterus aeneus* GÜNTHER, Proc. Zool. soc. Lond., 1860, p. 319 (Oaxaca, Mexico); KNER & STEINDACHNER, Abhandl. Bayer. akad. wiss., 1864, **10**, p. 46 (Rio Chagres)<sup>1</sup>; GÜNTHER, Cat. fishes Brit. mus., 1864, **5**, p. 326 (Oaxaca); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 53; EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 53; EIGENMANN, *Loc. cit.* 1893, **16**, p. 55; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 280; JORDAN & EVERMANN, Bull. 47, U. S. N. M., 1896, **1**, p. 333; VAILLANT, Bull. Mus. hist. nat., 1897, **3**, p. 221 (Rio Chagres)<sup>1</sup>; MEEK, Field Columbian mus. Publication, 1904, **5**, p. 86 (Lowland streams south of the city of Vera Cruz and of the Rio Balsas).
- Astyanax rutilus aeneus* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, **33**, p. 24 (Perez; Sulphur River; El Rancho, Rio Tenedores; Rio Kilagua; Rio Gualan; Rio Motagua; Rio Managua; Los Amates).
- Astyanax fasciatus aeneus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 433.
- Tetragonopterus panamensis* GÜNTHER, Cat. fishes Brit. mus., 1864, **5**, p. 324 (Pacific coast of Panama<sup>2</sup>; Yzabal).
- Tetragonopterus brevimanus* GÜNTHER, Cat. fishes Brit. mus., 1864, **5**, p. 325 (Rio San Geronima); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1893, **16**, p. 55.
- Tetragonopterus humilis* GÜNTHER, Cat. fishes Brit. mus., 1864, **5**, p. 327 (Lake Amatitlan, Guatemala); ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 276.
- Tetragonopterus finitimus* BOCOURT, Ann. sci. nat., 1868, ser. 5, **9**, p. 62 (Chinantla, Guatemala); VAILLANT & PELLEGRIN, Bull. Mus. hist. nat., 1903, **9**, p. 325.
- Astyanax finitimus* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 344, fig. 32 (Central America).
- Tetragonopterus belizianus* BOCOURT, Ann. sci. nat., 1868, ser. 5, **9**, p. 62 (Beliza); VAILLANT & PELLEGRIN, Bull. Mus. hist. nat., 1903, **9**, p. 326.
- Tetragonopterus cobanensis* BOCOURT, Ann. sci. nat., 1868, ser. 5, **9**, p. 62 (Hte. Vera Paz Coban); VAILLANT & PELLEGRIN, Bull. Mus. hist. nat., 1903, **9**, p. 324.
- Tetragonopterus oaxacanensis* BOCOURT, Ann. sci. nat., 1868, ser. 5, **9**, p. 62.

HABITAT.—Panama to Mexico.

<sup>1</sup> The only species of *Astyanax* found by Meek and Hildebrand in the Chagres is *A. ruberrimus*.

<sup>2</sup> The specimen of *T. panamensis* from the Pacific coast of Panama is probably *T. ruberrimus* or *T. fasciatus*.



*Specimens examined.*

| Catalogue number | Number of specimens | Size in mm.   | Locality                          | Collector  |
|------------------|---------------------|---------------|-----------------------------------|------------|
| 25291            | 3                   | 82-86         | Rio Tanateneo near Tonola, Chapas | Sumichrast |
| 10929 I.         | 14                  | 38-75         | Perez                             | Meek       |
| 11129 I.         | 2                   | 92, 113 about | Sulphur River                     | Miller     |
| 11130 I.         | 3                   | 64-103        | Rio Motagua at El Rancho          | Miller     |
| 11131 I.         | 2                   | 45, 116       | Rio Tenedores at Tenedores        | Miller     |
| 11132 I.         | 7                   | 40-101        | Rio Kilagua at Los Amates         | Miller     |
| 11135 I.         | 1                   | 114           | Rio Kilagua at Los Amates         | Miller     |
| 11133 I.         | 45                  | 35-96 about   | Rio Gualan at Gualan              | Miller     |
| 11134 I.         | 60                  | 42-99         | Rio Motagua at Gualan             | Miller     |
| 11136 I.         | 6                   | 60-88         | Rio Managua at Algeria            | Miller     |
| 11137 I.         | 4                   | 64-74         | E. of Los Amates                  | Miller     |
| 11138 I.         | 1                   | 56            | E. of Los Amates                  | Miller     |

There seems to be no doubt but that *Tetragonopterus belizanus* 5224 and 5225, Museum Histoire Naturelle, 12 specimens, and *T. finitimus*, 5223, Guatemala, 2 specimens, are typical *A. aeneus*. They have A. 27, 26, 27, 28, 30.

This species differs from typical *A. fasciatus* in the thicker body, more slender caudal peduncle, and in having usually 2 maxillary teeth.

For the details of the anal fin see the table (p. 297). While there is no difficulty in distinguishing this species from *A. macrophthalmus* it is impossible to assign any character to it that will at all times distinguish it from typical *A. fasciatus*.

## 54. ASTYANAX MEXICANUS (Filippi).

## Plate 49, figs. 4 &amp; 5.

*Tetragonopterus mexicanus* FILIPPI, Rev. et mag. zool., 1853, p. 166; STEINDACHNER, Ichthyol. notizen, 1869, 9, p. 11, pl. IV, figs. 1-4 (Lake Mexico; Izucar); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 55; ULREY, Ann. N. Y. acad. sci., 8, 1895, p. 282; JORDAN & EVERMANN, Bull. U. S. N. M., 1896, 1, p. 335; JORDAN & SNYDER, Bull. U. S. fish comm., 1900, 19, p. 125 (Rio Ixtla; Puente de Ixtla; Morelos); MEEK, Field Columbian mus. Publication, 1902, 3, p. 86, (Puente de Ixtla; Balsas; Cuicatlan; Venta Salada); 1904, 93, (Rio Balsas and Rio Tehucan to the Rio Grande).

*Astyanax mexicanus* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 345 (Monterey; Rio Ixtla; Rio Verde); EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 25 (Texas; Rio Nueces; Devil's River; Rio Leona; Comanche Springs; Elm Creek; Brownsville; Rio Seco; Caderita; China near Leon; Stockton; Rio Grande; Matamoros; Las Moras; Fort Clark; Monterey; Mexico); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 433.

*Astyanax argentatus* BAIRD & GIRARD, Proc. Acad. nat. sci. Phil., 1854, 7, p. 27; GIRARD, U. S. & Mex. bound. surv., 1859, p. 74 (Rio Nueces; Rio Leona; Zoquito; Comanche Springs; Elm Creek; San Felipe; Devil's River; Brownsville; Mouth of Rio Grande; Rio Sabinal); GÜNTHER, Cat. fishes Brit. mus., 1864, 5, p. 380; GARMAN, Bull. M. C. Z., 1881, 8, p. 92 (Tributaries of Lago de Muerté and springs near Monclava).



- Tetragonopterus argentatus* JORDAN & GILBERT, Syn. fishes N. Amer., 1882, p. 255; EIGENMANN, Proc. U. S. N. M., 1893, **16**, p. 56; EVERMANN & KENDALL, Bull. U. S. fish comm., 1894, **12**, p. 105 (Rio Nueces; Rio Leona; Rio Sabinal, mouth of the Rio Grande; Zoquito; Comanche Springs; Elm Creek; Turkey Creek; San Felipe; Devil's River; Brownsville); Woolman, Bull. U. S. fish comm., 1894, **14**, p. 60 (Rio Chihuahua); ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 282; JORDAN & EVERMANN, Bull. 47 U. S. N. M., 1896, **1**, p. 336; JORDAN & SNYDER, Bull. U. S. fish comm., 1901, **19**, p. 125 (Rio Verde near Rascon; Rio Tamesoe); MEEK, Field Columbian mus. Publication, 1902, **3**, p. 86 (Chihuahua; Santa Rosalie; Jimenez); COCKERELL, Univ. Colorado studies, 1908, **5**, p. 172, (North Spring River, Roswell, New Mexico).
- Tetragonopterus petenensis* GÜNTHER, Cat. fishes Brit. mus., 1864, **5**, p. 326 (part) (Lake Peten); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 53; EIGENMANN, Proc. U. S. N. M., 1893, **16**, p. 55; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 280.
- Tetragonopterus nitidus* BOCOURT, Ann. sci. nat., 1868, ser. 5, **9**, p. 62 (Cuernavaca, Mexico); VAILLANT & PELLEGRIN, Bull. Mus. hist. nat., 1902, p. 324.
- Tetragonopterus fulgens* BOCOURT, Ann. sci. nat., 1868, ser. 5, **9** (Cuernavaca); VAILLANT & PELLEGRIN, Bull. Mus. hist. nat., 1902, p. 324.
- Tetragonopterus streetsii* COPE, Proc. Acad. nat. sci. Phil., 1871, p. 218 (Coatzacoalecos River).

HABITAT.—Rio Grande Basin north to Roswell, New Mexico south to the Balsas and Papaloapam, Lake Peten.

*Specimens examined.*

| Catalogue number | Number of specimens | Size in mm.     | Locality     | Collector |
|------------------|---------------------|-----------------|--------------|-----------|
| 20872            | 3                   | 41-50           | Matamoras    |           |
| 10922 I.         | 5                   | 48-69           | Garza Valdez | Meek      |
| 10923 I.         | 5                   | 45-79           | Monterey     | Meek      |
| 10924 I.         | 1                   | 85              | Lerdo        | Meek      |
| 10925 I.         | 8                   | 33-76           | Rascon       | Meek      |
| 10926 I.         | 6                   | 74-99           | Cheitta      | Meek      |
| 10927 I.         | 7                   | 60-88           | Yantepec     | Meek      |
| 10921 I.         | 8                   | 53-80           | Victoria     | Meek      |
| 11489 I.         | 2                   | 59, 66          | Mexico       | Meek      |
| 11485 I.         | 5                   | 70-83           | Fort Clark   | Mearns    |
| 3490 I.          | 1                   | 60 <sup>1</sup> | Texas        | Mearns    |
| 4864 I.          | 1                   | 46              | Chihuahua    | Woolman   |

In distribution this species begins where *A. aeneus* leaves off. It is found from the Balsas and Papaloapam north to Texas. It is more slender than *A. aeneus* and has fewer anal rays, but does not materially differ in other respects.

Usually 4 teeth in the outer series of the premaxillary, 1 to 3 teeth in the maxillary.

For the details of the anal see page 297.

First few anal rays without pigment, the first two milk-white toward their tips.

55. *ASTYANAX TAENIATUS* (Jenyns).

Plate 47, figs. 3 & 4.

- Tetragonopterus taeniatus* JENYNS, Zool. Beagle. Fishes, 1842, p. 126 (Locogo Province, Rio de Janeiro); GÜNTHER, Cat. fishes Brit. mus., 1864, **5**, p. 329.

<sup>1</sup> To base of caudal.



*Astyanax taeniatus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 434.

*Tetragonopterus fasciatus* STEINDACHNER (*non* Cuvier), Süsswf. südöstl. Bras., 1876, **3**, p. 20, pl. 1, fig. 3, in part (Rio de Janeiro; Rio Parahyba; Rio Jequitinhonha); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 52; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 283.

HABITAT.—Costal streams from Bahia to Santos and Rio das Velhas.

*Specimens examined.*

| Catalogue number         | Number of specimens | Size in mm.        | Locality                        | Collector         |
|--------------------------|---------------------|--------------------|---------------------------------|-------------------|
| 20635                    | 4                   | 36–49 <sup>1</sup> | Parahyba                        | Agassiz & Bourget |
| 20889                    | 1                   | 68 <sup>1</sup>    | Itabapuana                      | Hartt & Copeland  |
| 20878, }<br>20880 part } | 26                  | 65 largest         | São Matheos                     | Thayer Exped.     |
| 21079                    | 4                   | 72–84              | Rio Novo                        | Thayer Exped.     |
| 21080                    | 2                   | 43                 | Rio Novo                        | Thayer Exped.     |
| 20931                    | 1                   | 96                 | Rio Parahyba                    | Thayer Exped.     |
| 21061                    | 2                   | 95, 97             | Rio de Janeiro                  | Thayer Exped.     |
| 20934                    | 1                   | 74 <sup>1</sup>    | Mendez                          | Thayer Exped.     |
| 20888                    | 1                   | 133                | Mendez                          | Hartt & Copeland  |
| 3374 C.                  | 5                   | 24–40 about        | Rio das Velhas                  | Haseman           |
| 3375 C.                  | 1                   | 70                 | Rio das Velhas                  | Haseman           |
| 3376 C.                  | 1                   | 40                 | Alagoinhas, Rio Catu            | Haseman           |
| 3377 C. <sup>2</sup>     | 40                  | 40–63              | Muniz Freire,<br>Rio Itapemerim | Haseman           |
| 3378 C.                  | 1                   | 45                 | Rio Pelad, near Santos          | Haseman           |

Jenyns described two small fishes “evidently distinct from either of the last two species, *A. fasciatus* and *A. scabripinnis* the characters of which are in some measures combined in them.”

He gives the scales as 7–40–6; A. 3/22; general form of *A. fasciatus*; fourteen or more teeth in the lower jaw; ventrals in exact line with the origin of the dorsal; depth 3 to base of caudal fork.

I have a number of specimens that evidently belong to this species. The scales are, however, never more than 39 in the lateral line, while the ventrals in a few specimens are immediately below the origin of the dorsal; they are in front of the dorsal in most cases. They are identical with Steindachner's *A. fasciatus* which is not the *A. fasciatus* of Cuvier.

Head 4.2–4.3; depth 2.5–2.33; D. 11; A. 21–24<sup>3</sup>, rarely 19 or 20; scales 5 or 7–32 to 39–4 or 5; eye 3–3.25 in the head; interorbital 2.5–3.

Premaxillary teeth three in the front row and five in the back; two maxillary teeth. Dentary teeth not abruptly smaller on the sides, more graduate, approaching Deuterodon.

Gill-rakers 8 + 13.

<sup>1</sup> To base of caudal.

<sup>2</sup> A.  $\frac{22}{1}$ ,  $\frac{23}{6}$ ,  $\frac{24}{1}$ ,  $\frac{25}{3}$ ,  $\frac{26}{3}$ ,  $\frac{28}{1}$ .

<sup>3</sup> Of the specimens mentioned above 20880 has but 19 anal rays, 20889 has depth 2.25.



Scales fewer, 32-34 in the specimens (21080 and 21079) north of the Parahyba.

Origin of ventrals and origin of dorsal, or second scale in front of the dorsal, equidistant from tip of snout; origin of anal and third scale behind the dorsal equidistant from snout.

A faint, vertical humeral spot; middle caudal rays dark.

Very closely allied to these is *A. eigenmanniorum*.

#### 56. ASTYANAX EIGENMANNIORUM (Cope).

Plate 48, figs. 1, 2.

*Tetragonopterus eigenmanniorum* COPE, Proc. Amer. philos. soc., 1894, **33**, p. 89 (Rio Grande do Sul);

FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 346 (Rio Grande do Sul).

*Astyanax eigenmanniorum* EIGENMANN, Rept. Princeton univ. exped. Patagonia, **3**, 1910, p. 434.

*Tetragonopterus maculatus lacustris* EIGENMANN, Ann. N. Y. acad. sci., 1894, **7**, p. 633 (in part) (Rio Grande do Sul).

*Astyanax fasciatus* EVERMANN & KENDALL, Proc. U. S. N. M., 1906, **31**, p. 81 (Rio Primero).

*Astyanax rutilus* EIGENMANN & OGLE (*non* Jenyns), Proc. U. S. N. M., 1907, **33**, p. 20 (Tieté, Rio Grande do Sul).

HABITAT.—Rio das Velhas, South to Rio Grande do Sul; Sapucay, Paraguay and Cordova, Argentina.

#### *Specimens examined.*

| Catalogue number     | Number of specimens | Size in mm.      | Locality                 | Collector   |
|----------------------|---------------------|------------------|--------------------------|-------------|
| 4488 I.              | 10                  | 75-95            | Rio Grande do Sul        | Von Ihering |
| 9294                 | 1                   | 73 <sup>1</sup>  | Rio Grande do Sul        | Von Ihering |
| 11107                | 4                   | 48-82 about      | Rio Primero, Cordova     | Titcomb     |
| 3384 C.              | 5                   | 76-111           | Sapina, São Paulo        | Haseman     |
| 3385 C. <sup>2</sup> | 73                  | 135 <sup>3</sup> | Porto Uniao, Rio Iguassú | Haseman     |
| 3386 C.              | 1                   | 37               | Cacequy                  | Haseman     |
| 3387 C.              | 90                  | 40-63            | Porto Alegre             | Haseman     |
| 3388 C.              | 10                  | 49-80            | Cachoeira                | Haseman     |
| 3389 C. <sup>4</sup> | 90                  | 35-106           | Bebedouro, Rio Pardo     | Haseman     |
| 3390 C.              | 2                   | 52, 64           | Sapucay, Paraguay        | Haseman     |
| 3391 C. <sup>5</sup> | 16                  | 29-63 about      | Sete Lagoas              | Haseman     |
| 3392 C. <sup>6</sup> | 19                  | 18-60            | Rio das Velhas           | Haseman     |
| 3393 C. <sup>7</sup> | 4                   | 85-125           | Rio das Velhas           | Haseman     |
| 3394 C. <sup>8</sup> | 13                  | 48-87            | Cachoeira, Rio Jacuhy    | Haseman     |

<sup>1</sup> To base of caudal.

<sup>2</sup> 19, 20, 21, 22, 23, 24, 25, 26, number of anal rays.

1 1 3 3 4 1 5 1 number of specimens.

Scales in four specimens 35, 36, 37, 38.

<sup>3</sup> Largest specimen.

<sup>4</sup> A.  $\frac{24}{3}$ ,  $\frac{25}{4}$ ,  $\frac{26}{3}$ ,  $\frac{27}{1}$ . Teeth 4-4, 3-3, 4-4 in the first row of the premaxillary of three specimens.

<sup>5</sup> Depth 2.2-2.5 (2.8 in one), A.  $\frac{23}{3}$ ,  $\frac{25}{2}$ ,  $\frac{26}{5}$ ,  $\frac{27}{1}$ . Those with A. 23 and 26 are certainly alike.

<sup>6</sup> A.  $\frac{21}{1}$ ,  $\frac{22}{3}$ ,  $\frac{23}{4}$ ,  $\frac{24}{2}$ .

<sup>7</sup> A. 25 in all four.

<sup>8</sup> A.  $\frac{26}{3}$ ,  $\frac{27}{1}$ ,  $\frac{28}{1}$ ,  $\frac{29}{1}$ ,  $\frac{30}{1}$ . Scales  $\frac{34}{1}$ ,  $\frac{35}{1}$ ,  $\frac{36}{2}$ ,  $\frac{39}{1}$ . Depth 2.5-2.7.



PLATE 30.



PLATE 30.

(Annals Carnegie mus., 8, Plate 1, 2).

Fig. 1. *Hyphessobrycon duragenys* Ellis.

3023 C. M. 68 mm. *Type*. Mogy das Cruzes, Brazil.

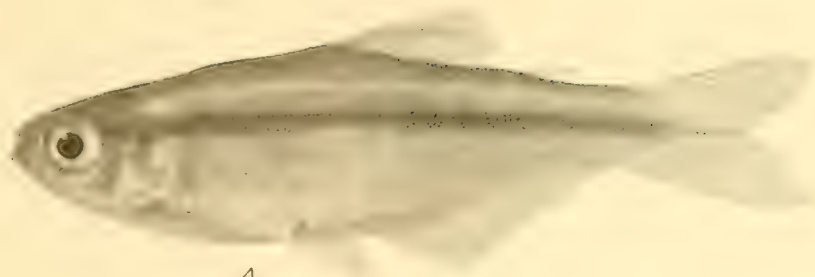
Figs. 2 and 3. *Hyphessobrycon bifasciatus* Ellis.

3026 C. M. 44 mm., 37 mm. ♂ and ♀. *Types*. Campos, Brazil.

Fig. 4. *Hyphessobrycon melanopleurus* Ellis.

3035 C. M. 34 mm. *Type*. Alto da Serra, Southeastern Brazil.





4



3



2



1







PLATE 31.



PLATE 31.

(Annals Carnegie mus., 8, Plate 1).

Fig. 1. *Hasemania maxillaris* Ellis.

2937 C. M. 29 mm. *Type.* Porto Uniao, Southeastern Brazil.

Fig. 2. *Hasemania melanura* Ellis.

3002 C. M. 35 mm. *Type.* Porto Uniao, Southeastern Brazil.

Fig. 3. *Hasemania bilineata* Ellis.

3004 C. M. 41 mm. *Type.* Alto da Serra, Southeastern Brazil.











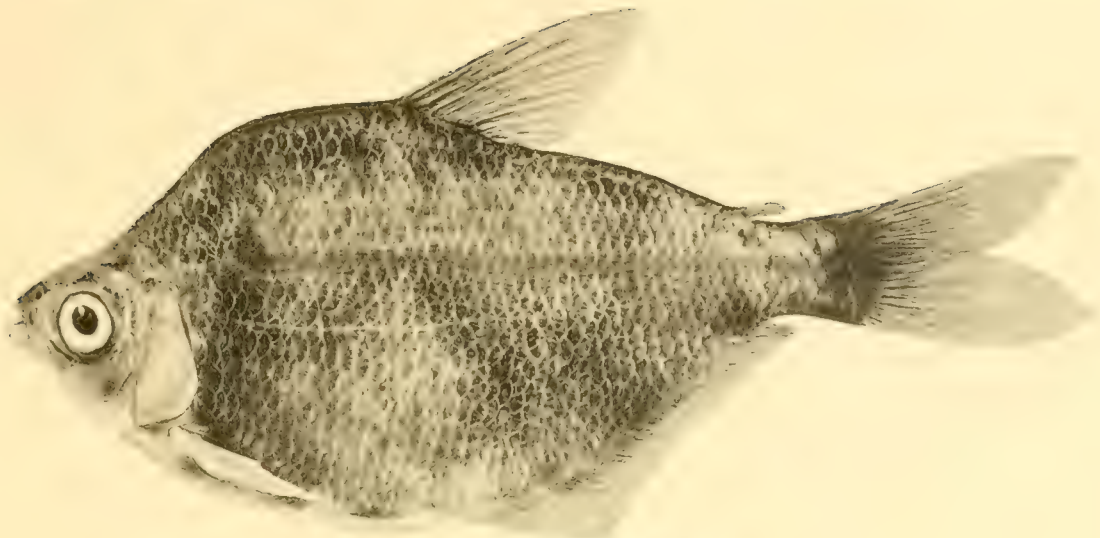
PLATE 32.



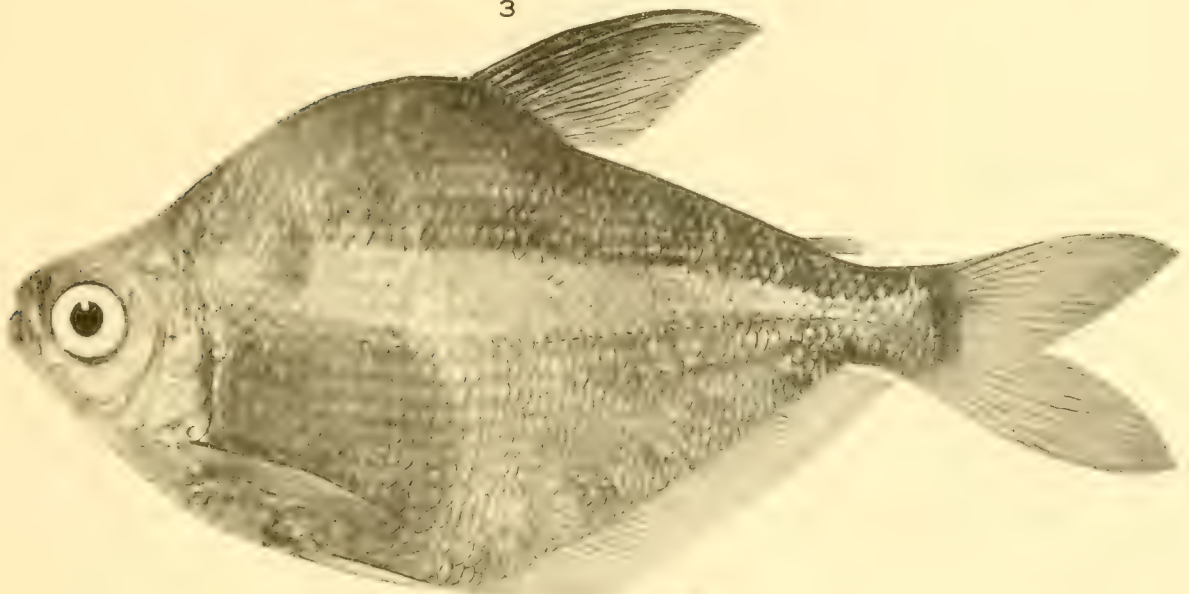
PLATE 32.

- Fig. 1. *Psellogrammus kennedyi* (Eigenmann).  
3223 C. M. 46 mm. Caceres, Brazil.  
The lateral line is erroneously shown as complete.
- Fig. 2. *Ctenobrycon hauxwellianus* (Cope).  
20752 M. C. Z. 95 mm. Tabatinga, Brazil.
- Fig. 3. *Astyanax alleni* (Eigenmann & McAtee).  
10158 I. U. M. 104 mm. Corumba, Brazil.

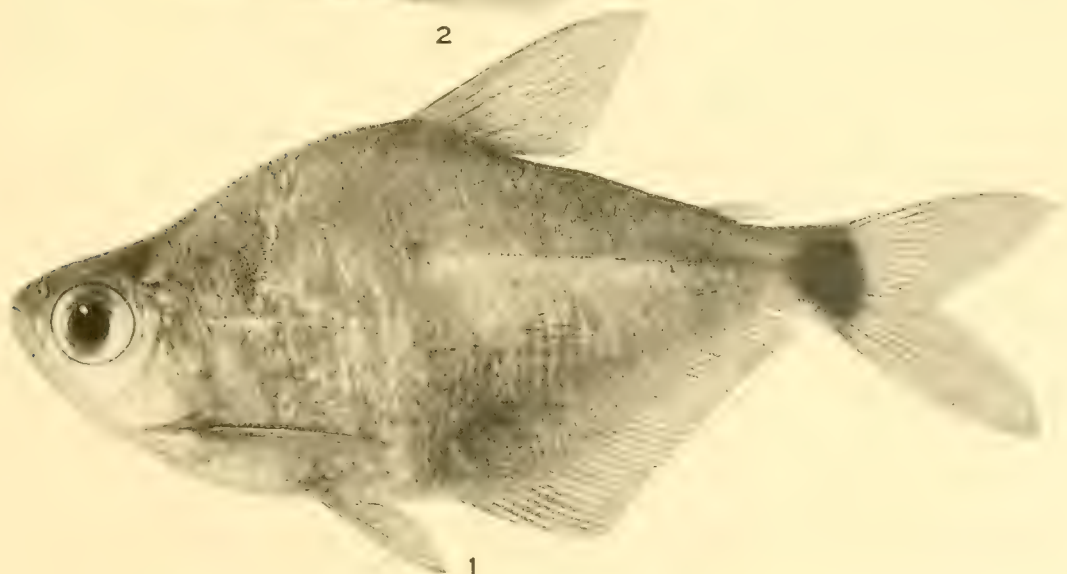




3



2



1







PLATE 40.



PLATE 40.

- Fig. 1. *Astyanax bourgeti* Eigenmann.  
Part of 20788 M. C. Z. 92 mm. *Type*. Tabatinga, Brazil.
- Fig. 2. *Astyanax anterior* Eigenmann.  
Part of 20768 M. C. Z. 91 mm. *Type*. Tabatinga, Brazil.
- Fig. 3. *Astyanax riveti* Pellegrin.  
From the *Type* in the Jardin des Plantes. Rio Pove, Ecuador.
- Fig. 4. *Astyanax festae* (Boulenger).  
9587 Mus. Stanford Univ. 63 mm. Mirador, Ecuador.
- Fig. 5. *Astyanax pellegrini* (Eigenmann & Kennedy).  
10245 I. U. M. 87 mm. to end of middle caudal rays. Paraguay.



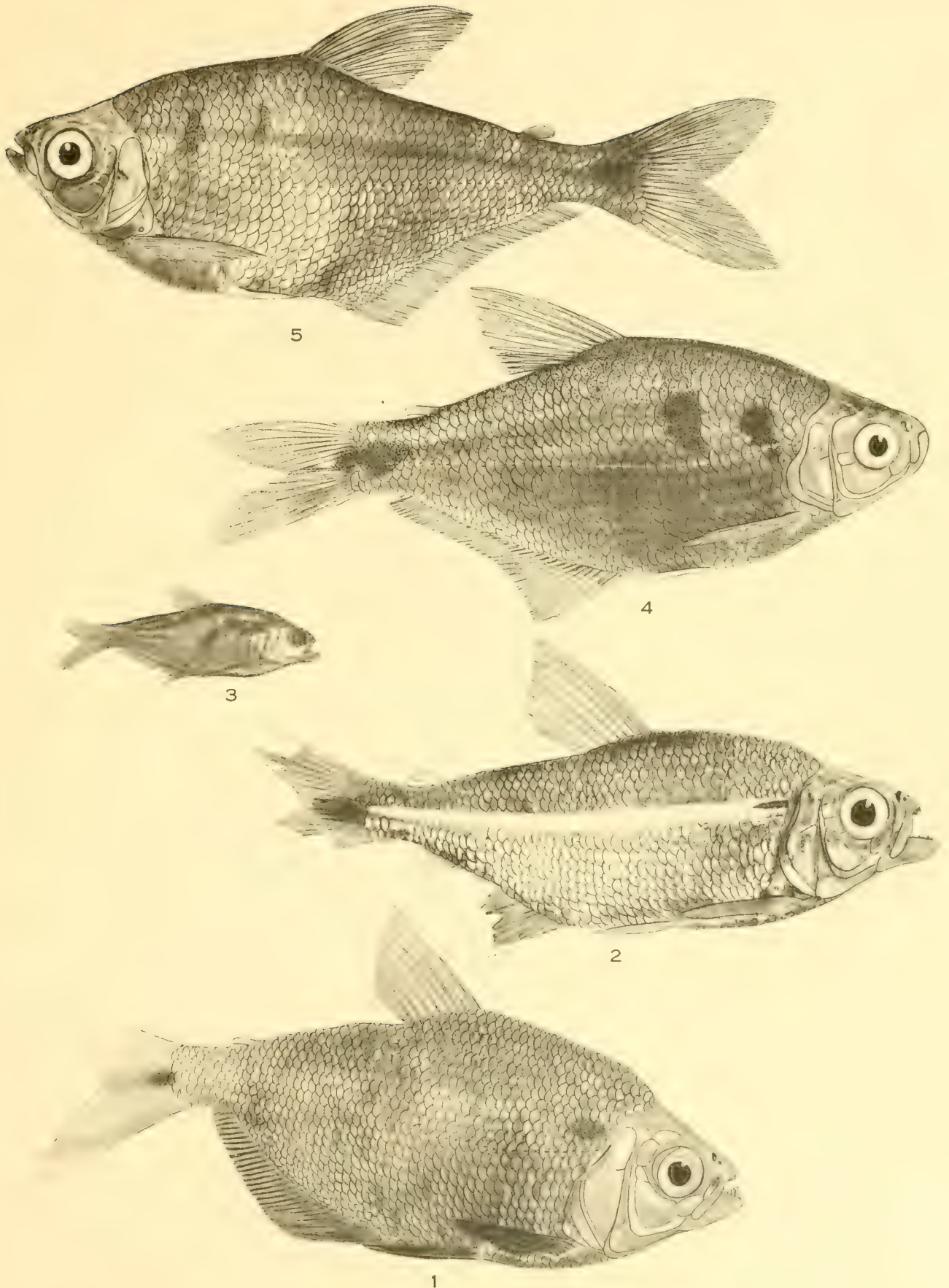








PLATE 41.



PLATE 41.

- Fig. 1. *Astyanax symmetricus* Eigenmann.  
Part of 20768 M. C. Z. *Type*. Tabatinga, Brazil.  
Caudal restored.
- Fig. 2. *Astyanax asymmetricus* Eigenmann.  
20763 M. C. Z. 45 mm. Tabatinga, Brazil.
- Fig. 3. *Astyanax zonatus* Eigenmann.  
Part of 20768 M. C. Z. 59 mm. *Type*. Tabatinga, Brazil.



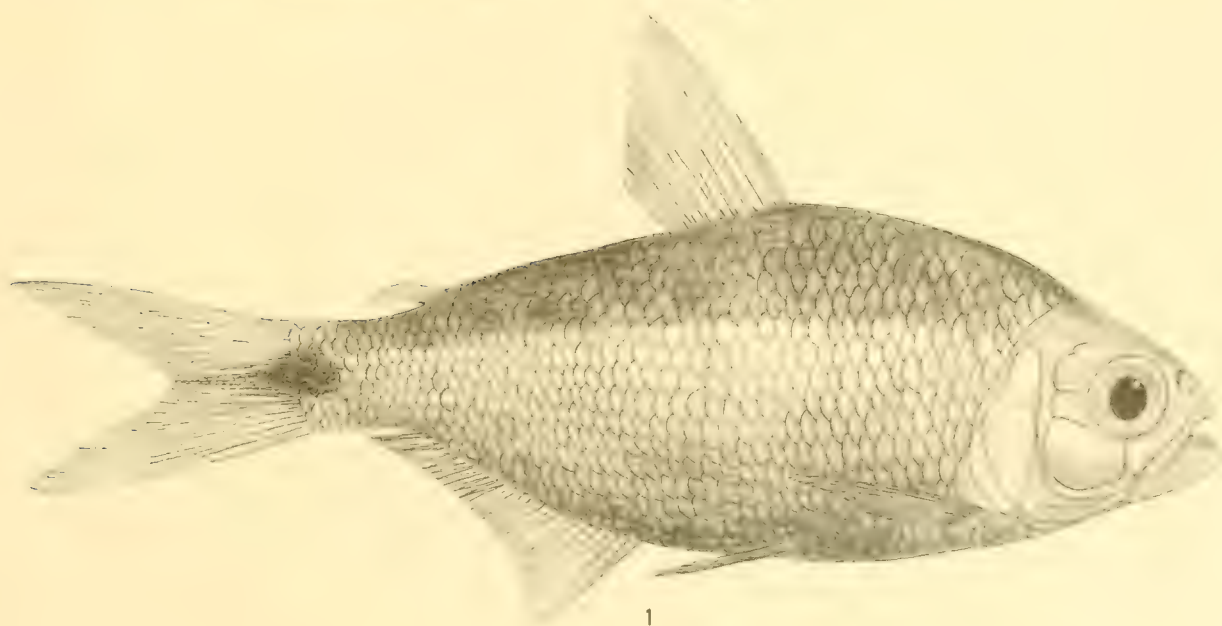
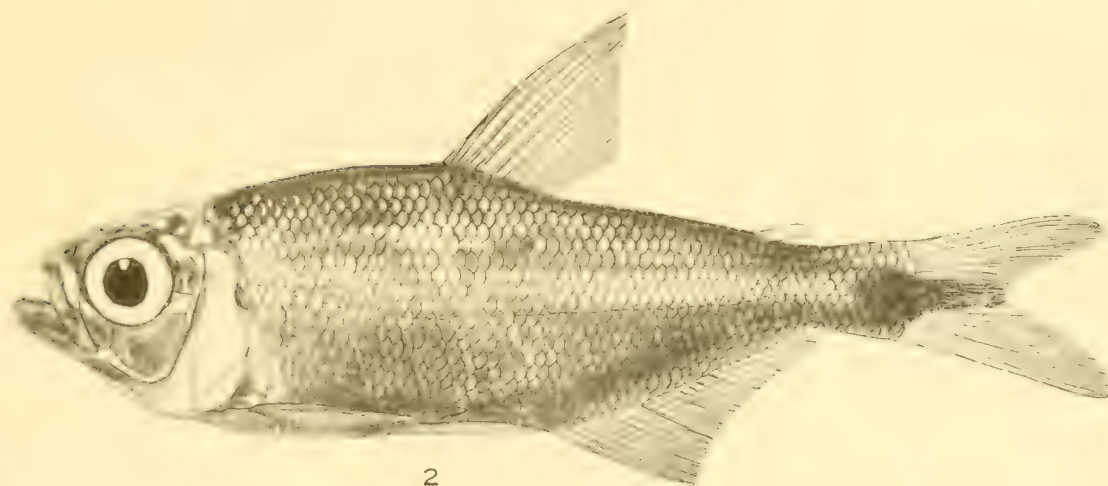
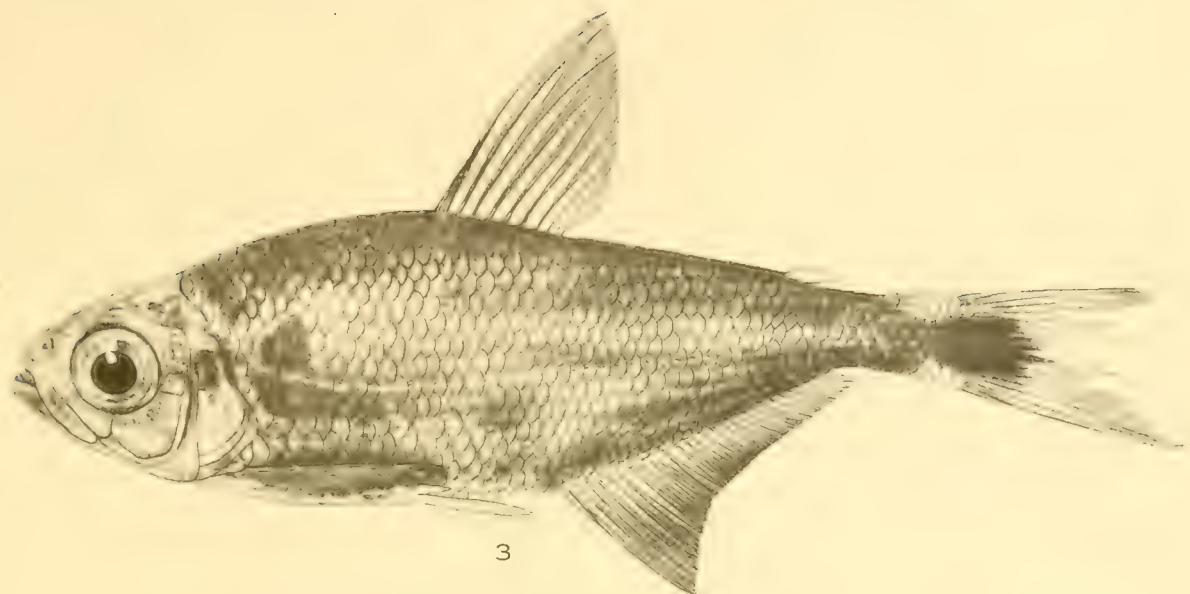








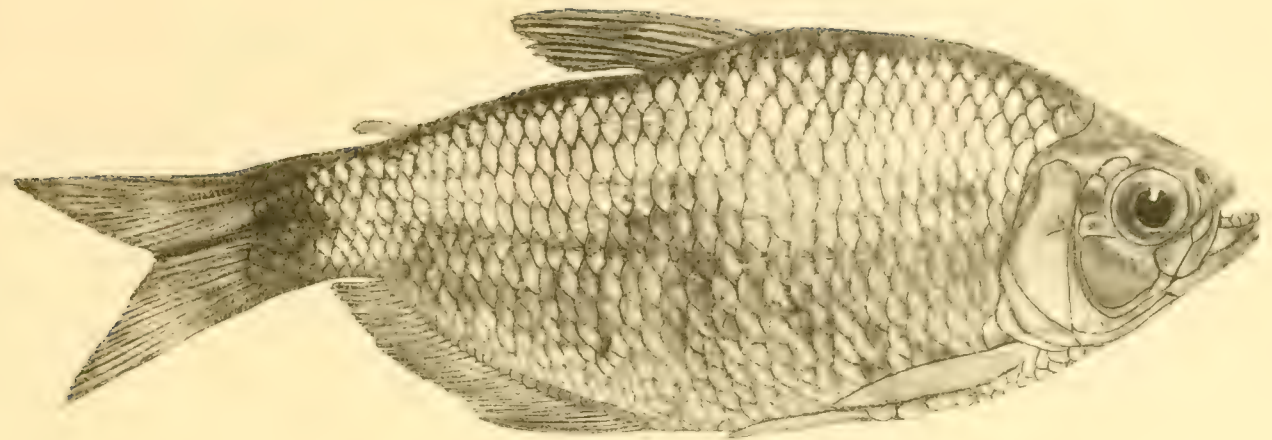
PLATE 42.



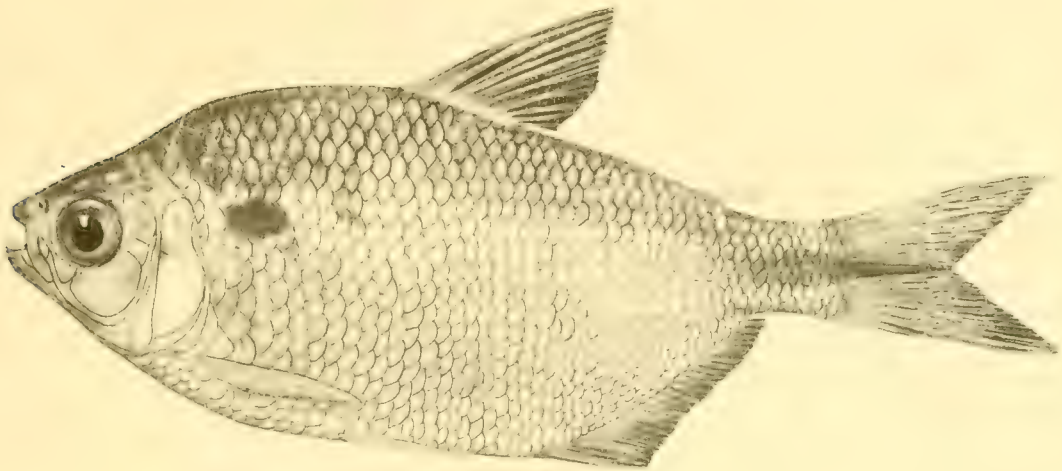
PLATE 42.

- Fig. 1. *Astyanax janeiroensis* Eigenmann.  
21057 M. C. Z. 92 mm. *Type*. Rio de Janeiro, Brazil.
- Fig. 2. *Astyanax abramis* (Jenyns).  
10000 I. U. M. 70 mm. to base of caudal. Asuncion, Paraguay.  
Caudal restored.
- Fig. 3. *Astyanax orthodus* Eigenmann.  
55655 U. S. N. M. 92 mm. *Type*. Truando, Colombia.

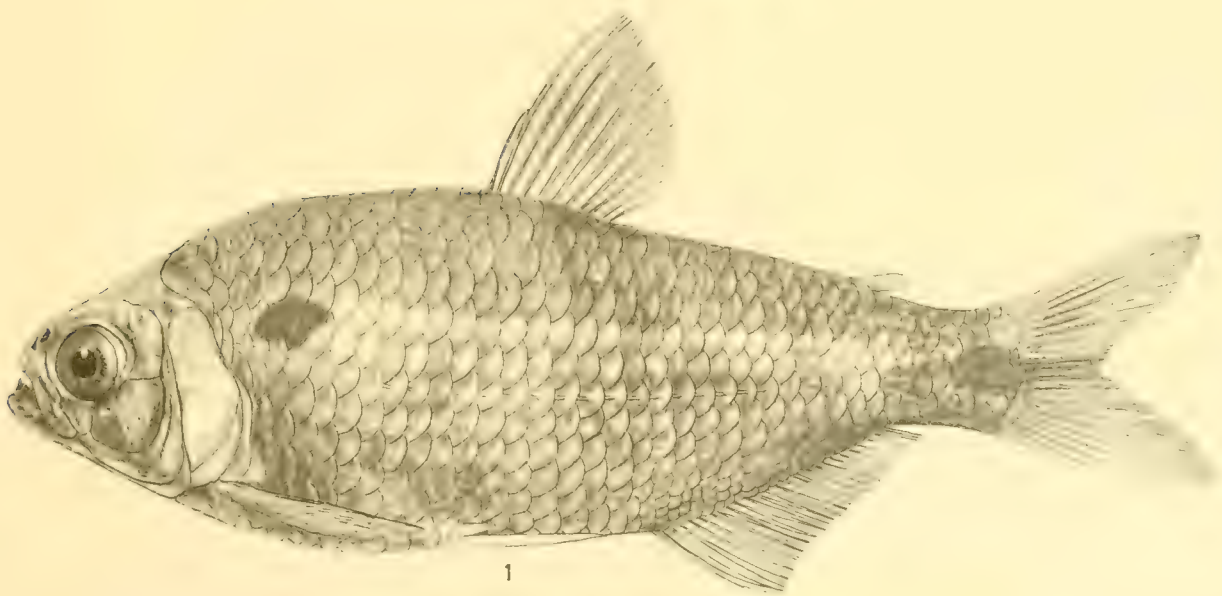




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PLATE 43.



PLATE 43.

- Fig. 1. *Astyanax caucanus* (Steindachner).  
12762 I. U. M. 111 mm. Calamar, Colombia.
- Fig. 2. *Astyanax atratoensis* Eigenmann.  
12756 I. U. M. 122 mm. Quibdo, Colombia.
- Fig. 3. *Astyanax stilbe* (Cope).  
34589 U. S. N. M. 78 mm. to base of caudal. Para, Brazil.



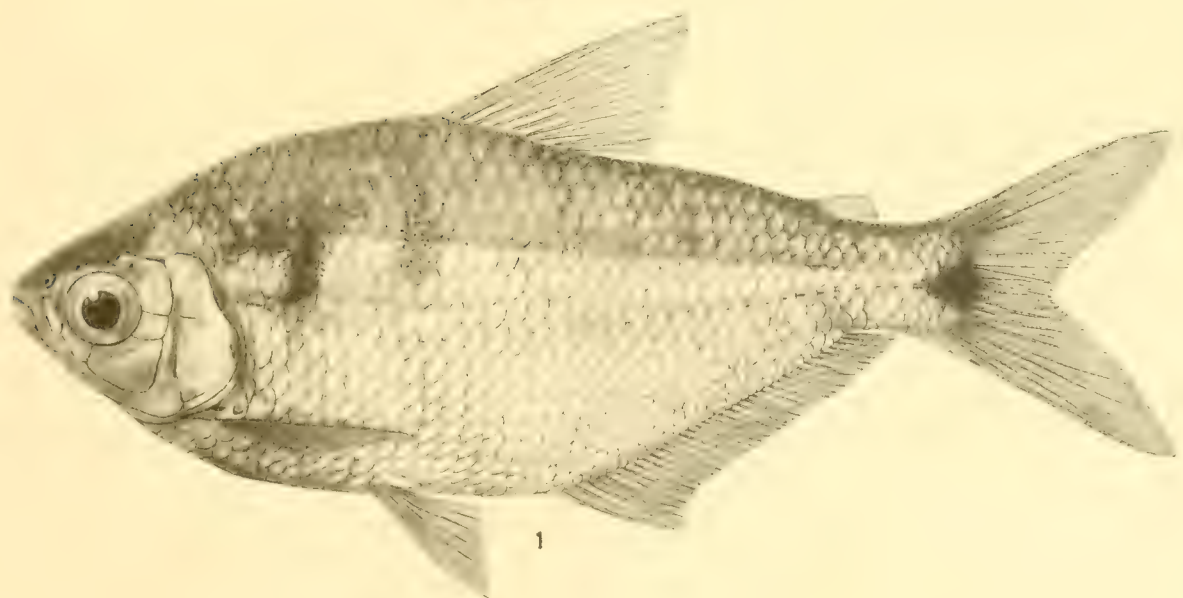
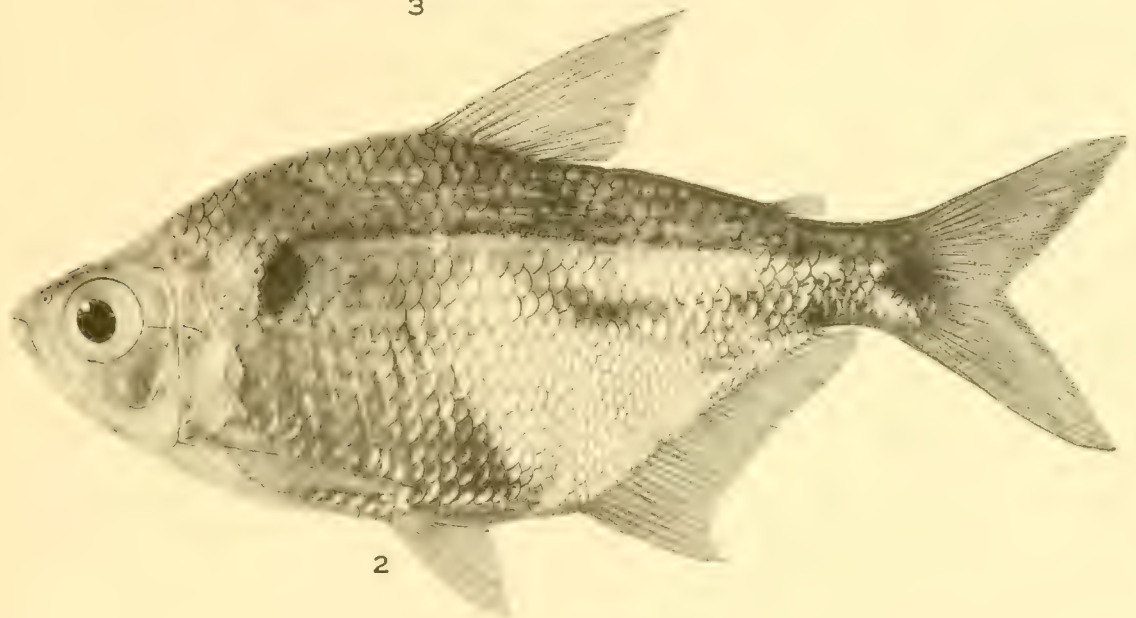
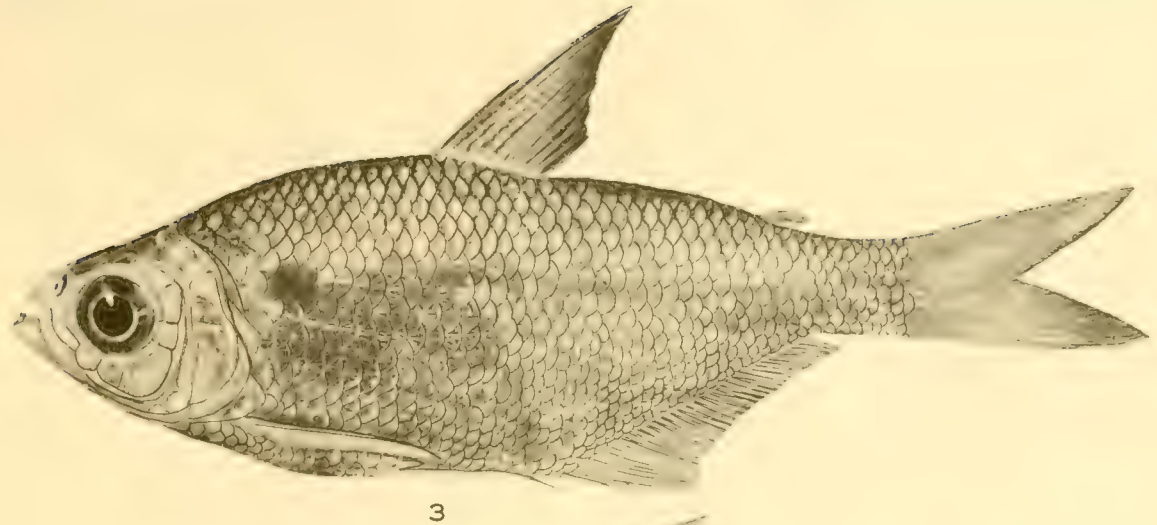








PLATE 44.



PLATE 44.

- Fig. 1. *Astyanax ruberrimus* Eigenmann.  
4912 C. M. 107 mm. *Type*. Istmina, Colombia.
- Fig. 2. *Astyanax lineatus* (Perugia).  
3292 C. M. 100 mm. Sapucay, Paraguay.
- Fig. 3. *Astyanax cordovae* (Günther).  
11093 I. U. M. 65 mm. to base of caudal. Rio Primero, Argentina.
- Fig. 4. *Astyanax rubropictus* (Berg).  
From a specimen in the British Museum. Cachi Salta, Argentina, 2500 meters.



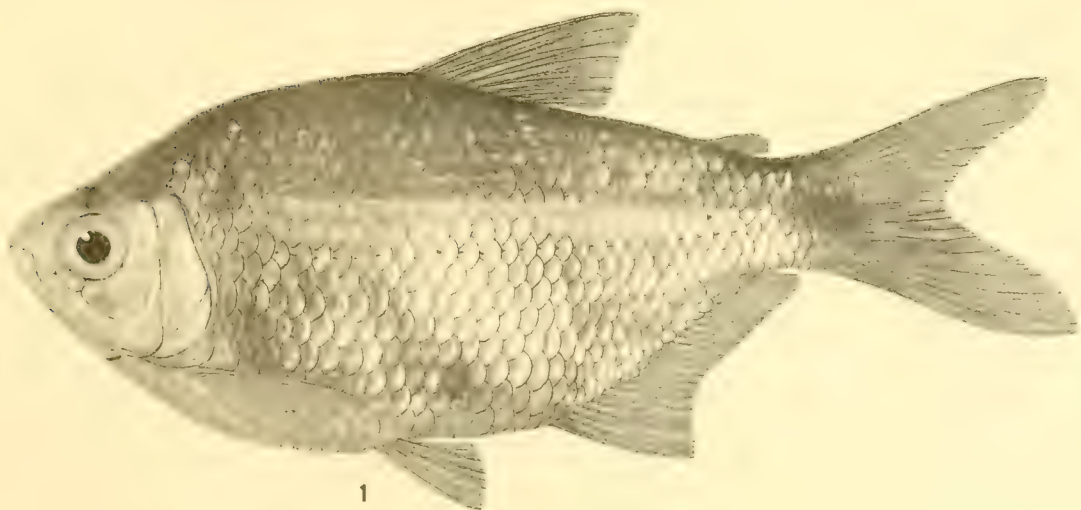
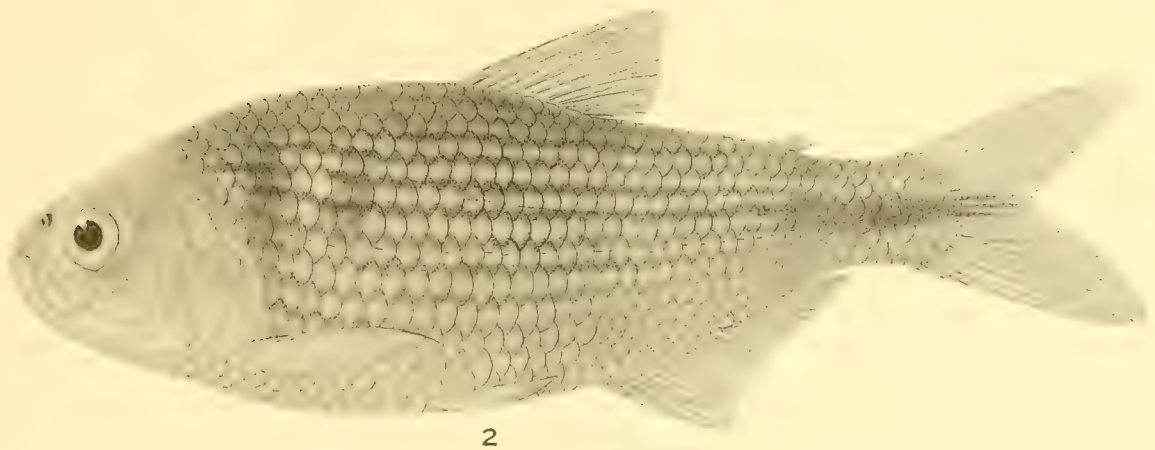
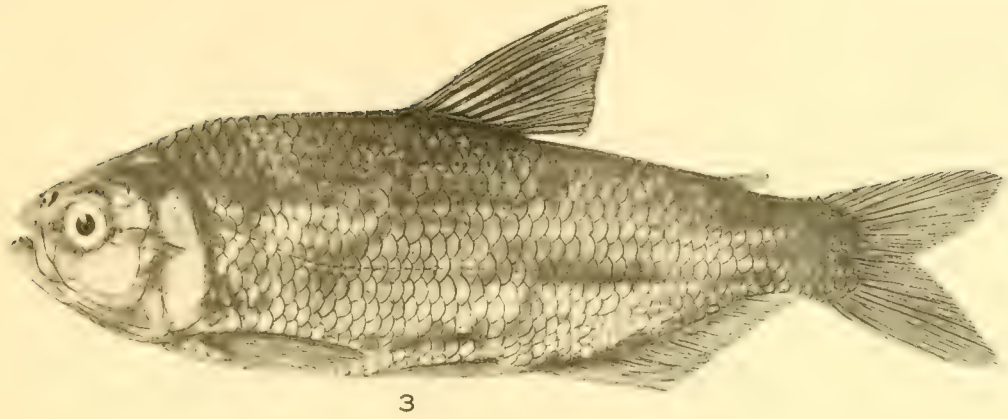








PLATE 45.



PLATE 45.

- Fig. 1. *Astyanax fasciatus* (Cuvier).  
12741a I. U. M. 163 mm. ♀. Boca de Raspadura, Colombia.
- Fig. 2. *Astyanax fasciatus* (Cuvier).  
12741b I. U. M. 139 mm. Boca de Raspadura, Colombia.
- Fig. 3. *Astyanax fasciatus* (Cuvier).  
3446 C. M. 136 mm. Rio Ribeira, Southeastern Brazil.
- Fig. 4. *Astyanax fasciatus* (Cuvier).  
After *Tetragonopterus cuvieri* Lütken.
- Fig. 5. *Astyanax fasciatus* (Cuvier).  
21048 M. C. Z. 114 mm. Rio San Francisco, Brazil.
- Fig. 6, ♀ and 7, ♂. *Astyanax fasciatus* (Cuvier).  
After *Tetragonopterus rutilus* Steindachner.



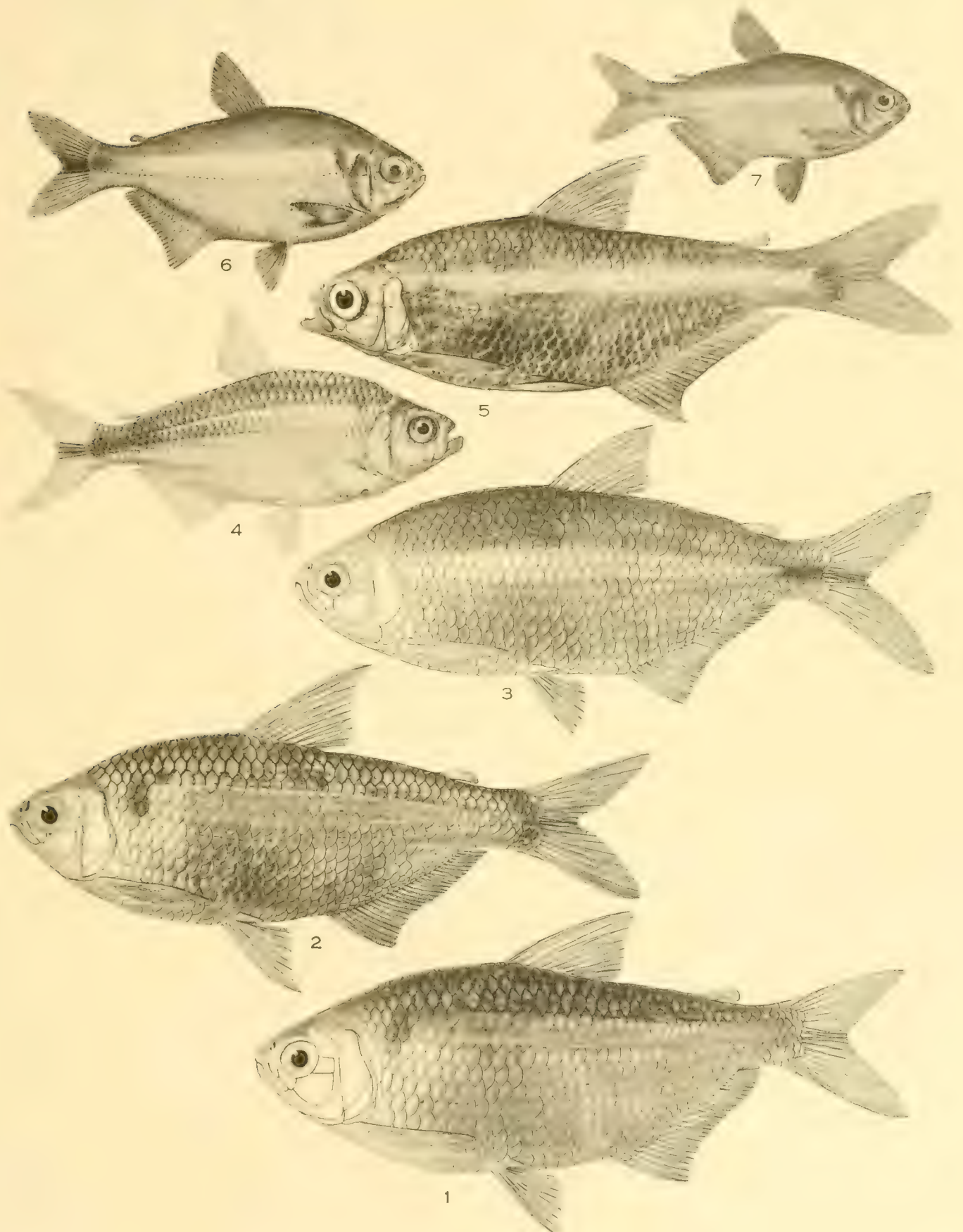








PLATE 46.



PLATE 46.

- Fig. 1. *Astyanax scabripinnis rivularis* (Lütken).  
M. C. Z. 75 mm. Santo Sera, Brazil.
- Fig. 2 and 3. *Astyanax scabripinnis rivularis* (Lütken).  
After Lütken.
- Fig. 4. *Astyanax scabripinnis* (Jenyns).  
21059 M. C. Z. 116 mm. Rio de Janeiro, Brazil.
- Fig. 5 and 6. *Astyanax scabripinnis* (Jenyns).  
After *Tetragonopterus jenynsii* Steindachner.
- Fig. 7. *Astyanax fasciatus parahybae* Eigenmann.  
20635 M. C. Z. 103 mm. Rio Parahyba, Brazil.



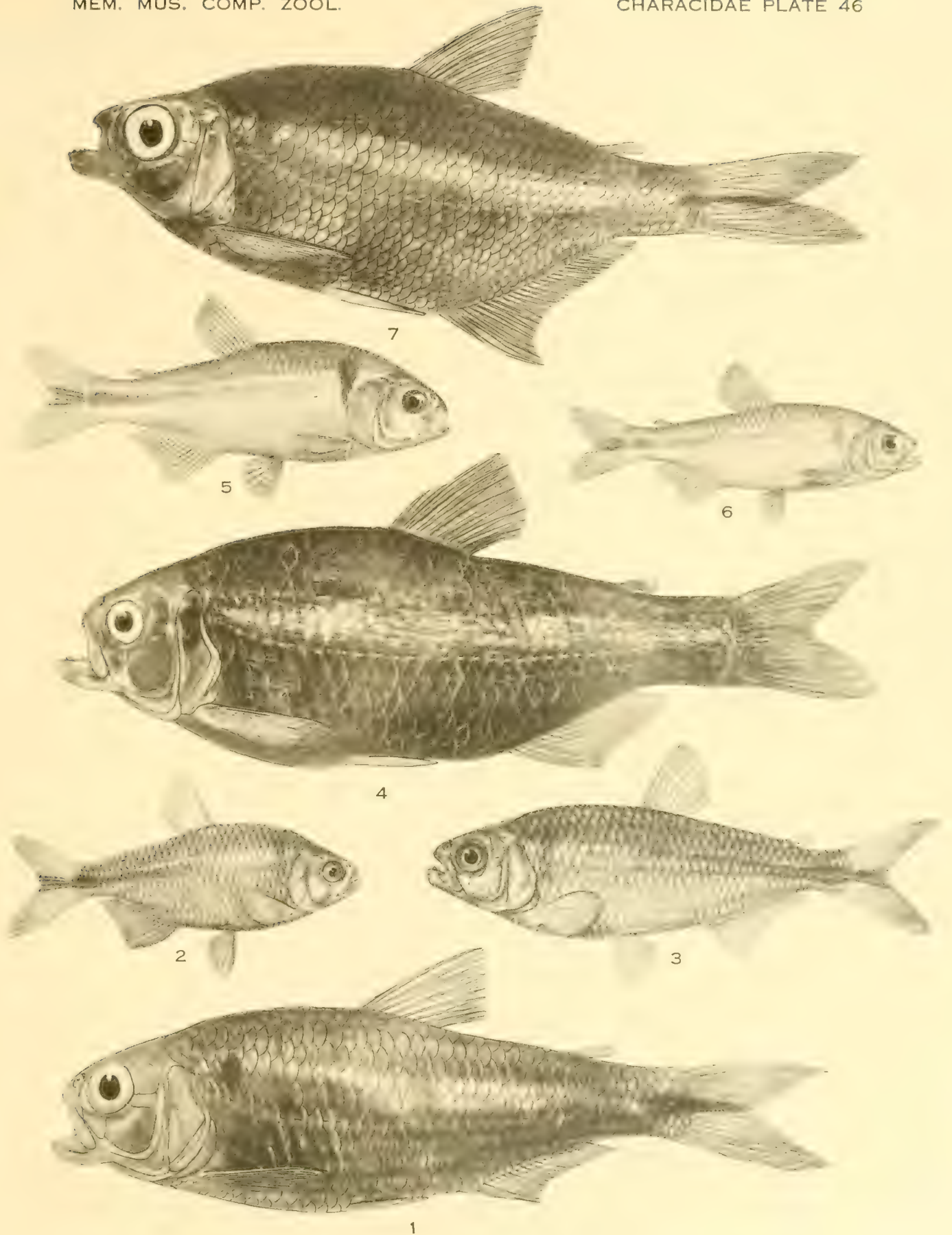








PLATE 47.



PLATE 47.

- Fig. 1. *Astyanax giton* Eigenmann.  
20936 M. C. Z. 67 mm. Rio Parahyba, Brazil.
- Fig. 2. *Astyanax brevirohinus* Eigenmann.  
20905 M. C. Z. 68 mm. *Type*. Rio Jequitinhonha, Brazil.
- Fig. 3. *Astyanax taeniatus* (Jenyns).  
21061 M. C. Z. 95 mm. Rio de Janeiro, Brazil.
- Fig. 4. *Astyanax taeniatus* (Jenyns).  
After *Astyanax fasciatus* Steindachner. *Non* Cuvier.
- Fig. 5. *Astyanax scabripinnis laticeps* (Cope).  
After Cope.



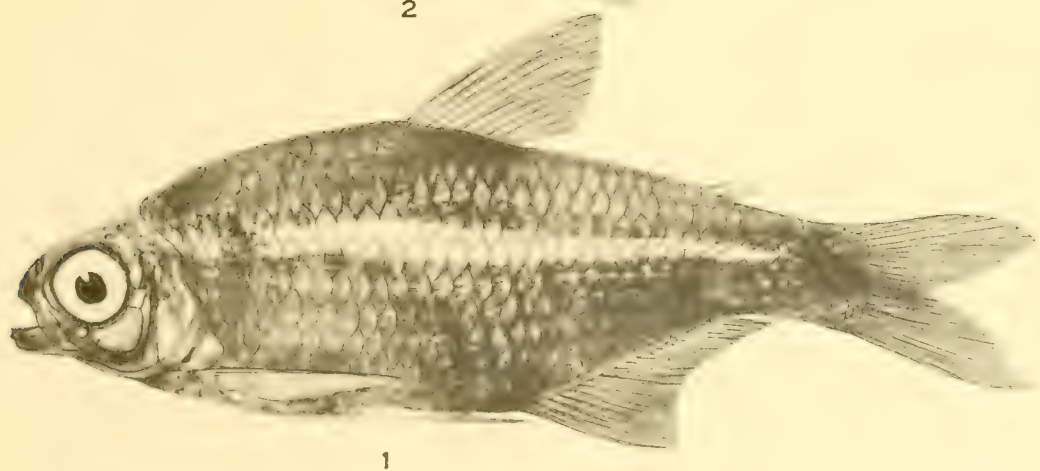
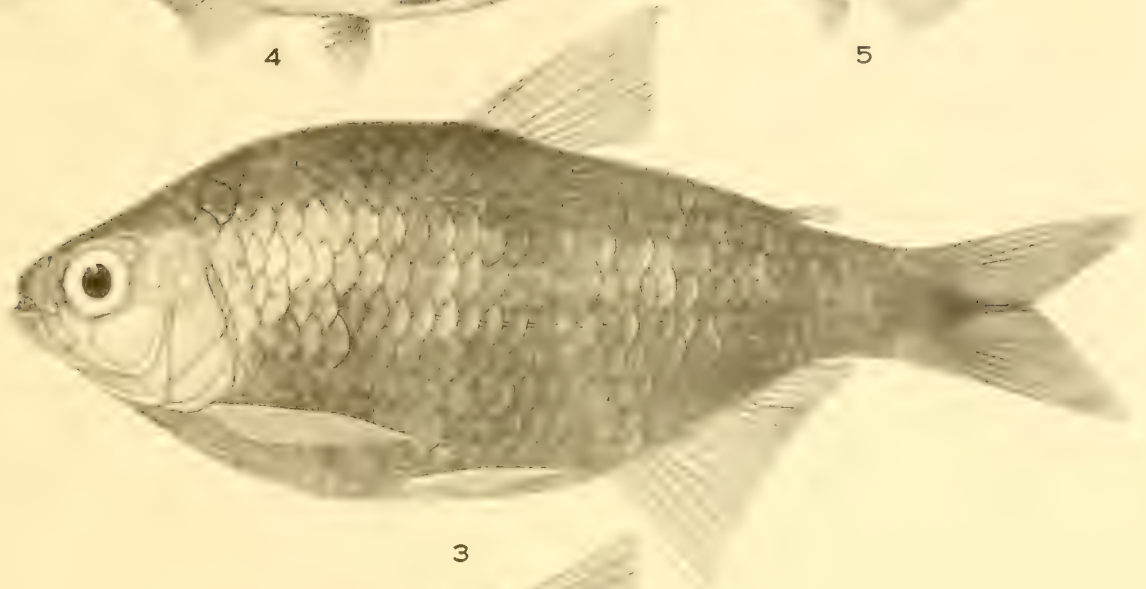
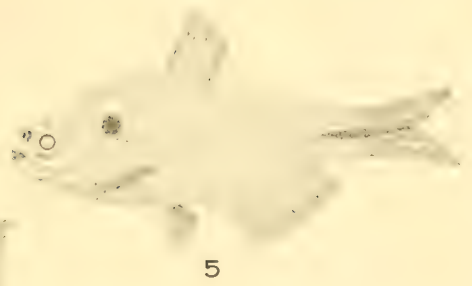
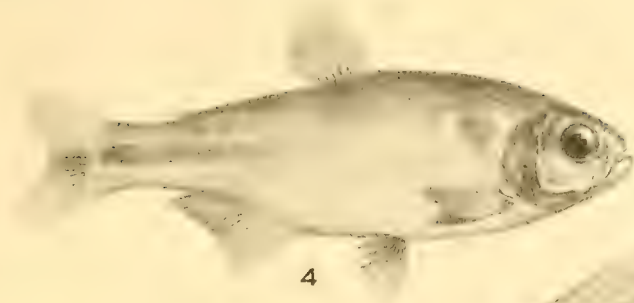








PLATE 48.



PLATE 48.

- Fig. 1. *Astyanax eigenmanniorum* (Cope).  
9294 I. U. M. 94.5 mm. Rio Tieté, Southeastern Brazil.
- Fig. 2. *Astyanax eigenmanniorum* (Cope).  
After Cope.
- Fig. 3. *Astyanax scabripinnis intermedius* Eigenmann.  
20684 M. C. Z. 53 mm. Rio Parahyba, Brazil.
- Fig. 4. *Astyanax microlepis* Eigenmann.  
5001 C. M. 86 mm. *Type*. Piedra Moler, Colombia.



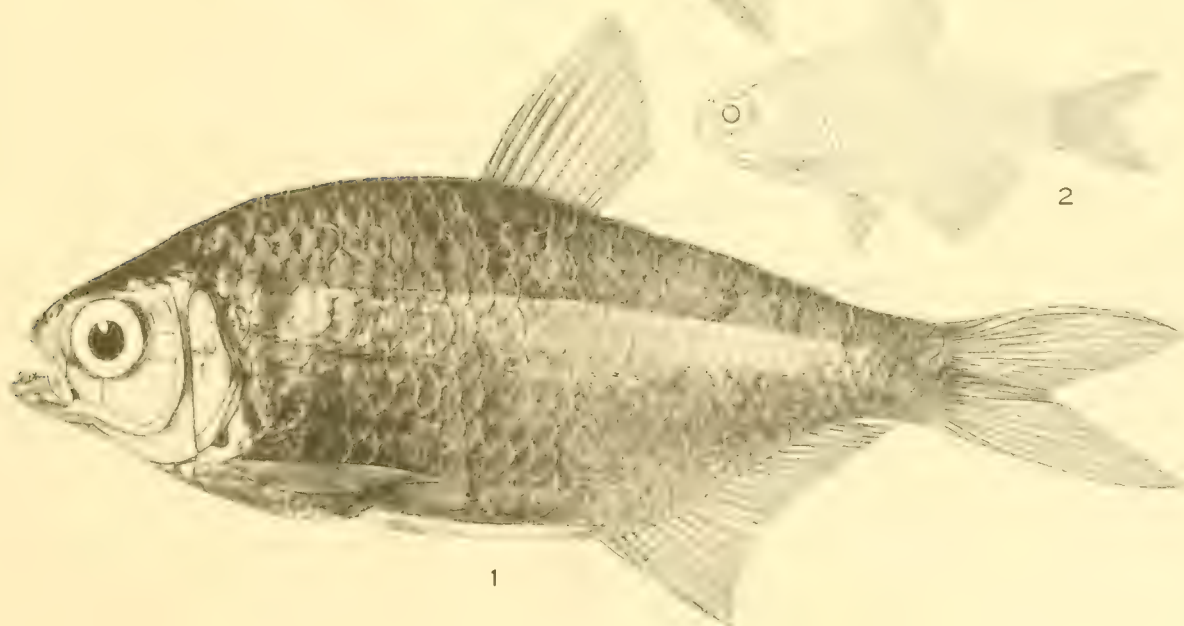
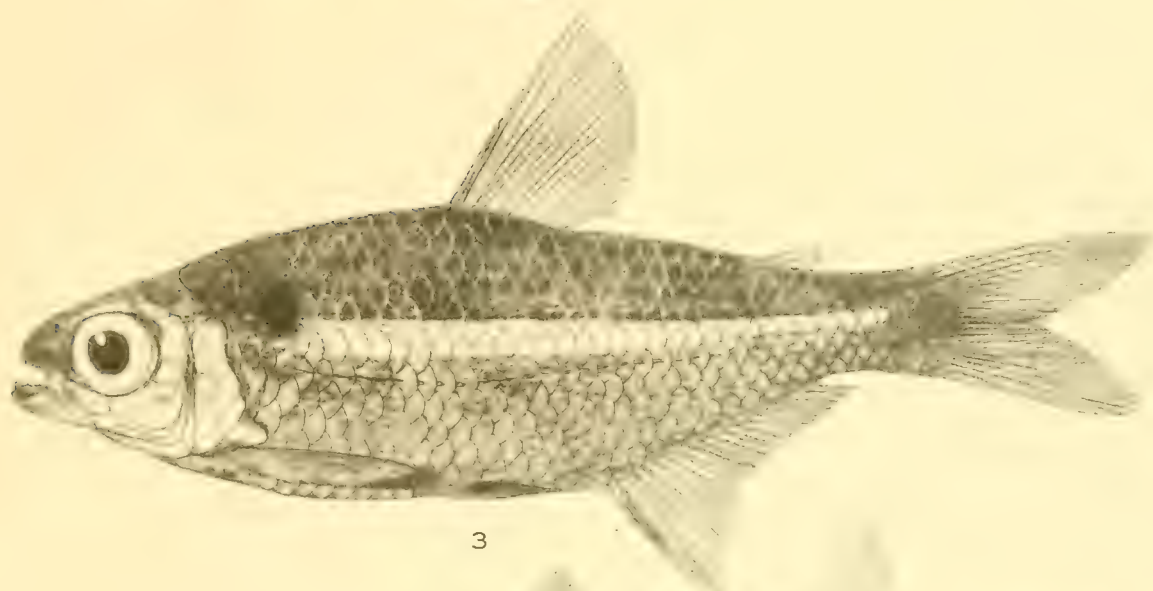
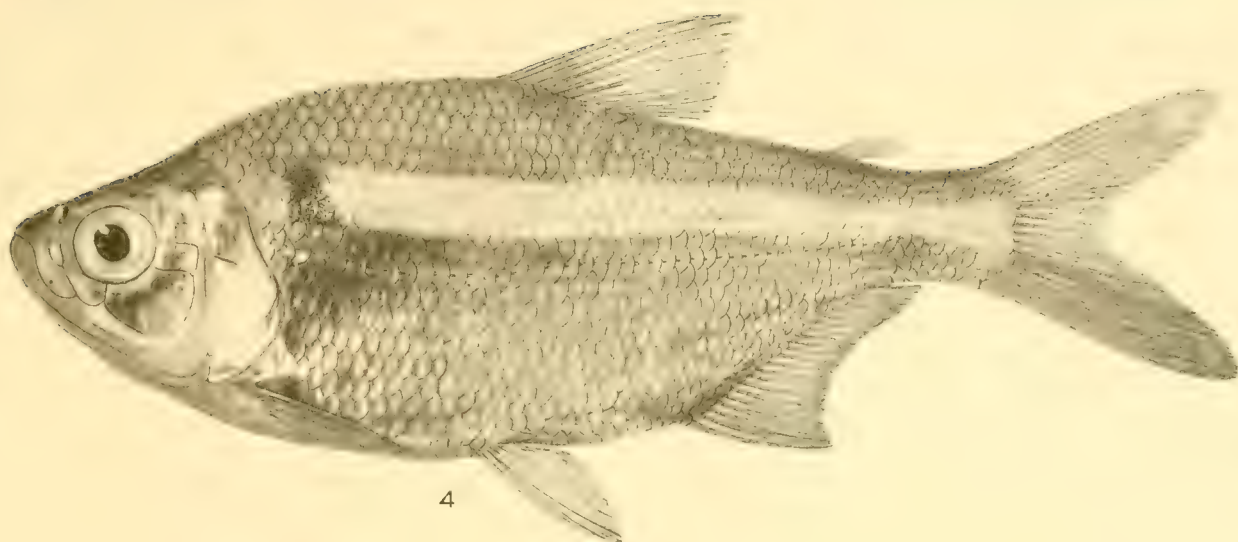








PLATE 49.



PLATE 49.

Fig. 1. *Astyanax albeolus* Eigenmann.

6241 F. M. 116 mm. Rio Machucha, Costa Rica.

Figs. 2 and 3. Composite of Steindachner's figures of *A. fischeri* which is *fasciatus* and the color of *ruberrimus* from the same locality. The combination was made when it was thought there was but one species of *Astyanax* in the type-locality of *fischeri* and that Steindachner's artist had omitted the color spots on the caudal. Hildebrand has just found that both *fasciatus* and *ruberrimus* occur in the type-locality of *fischeri* and that the latter is a synonym of *fasciatus*.

Figs. 4 and 5. *Astyanax mexicanus* (Filippi).

(4) 10927 I. U. M. ♀. 80 mm. Victoria, Mexico.

(5) 10921 I. U. M. ♂. 73 mm. Yantepec, Mexico.

Fig. 6. *Astyanax fasciatus macrophthalmus* Regan.

10928 I. U. M. 82 mm. Motzorongo, Mexico.



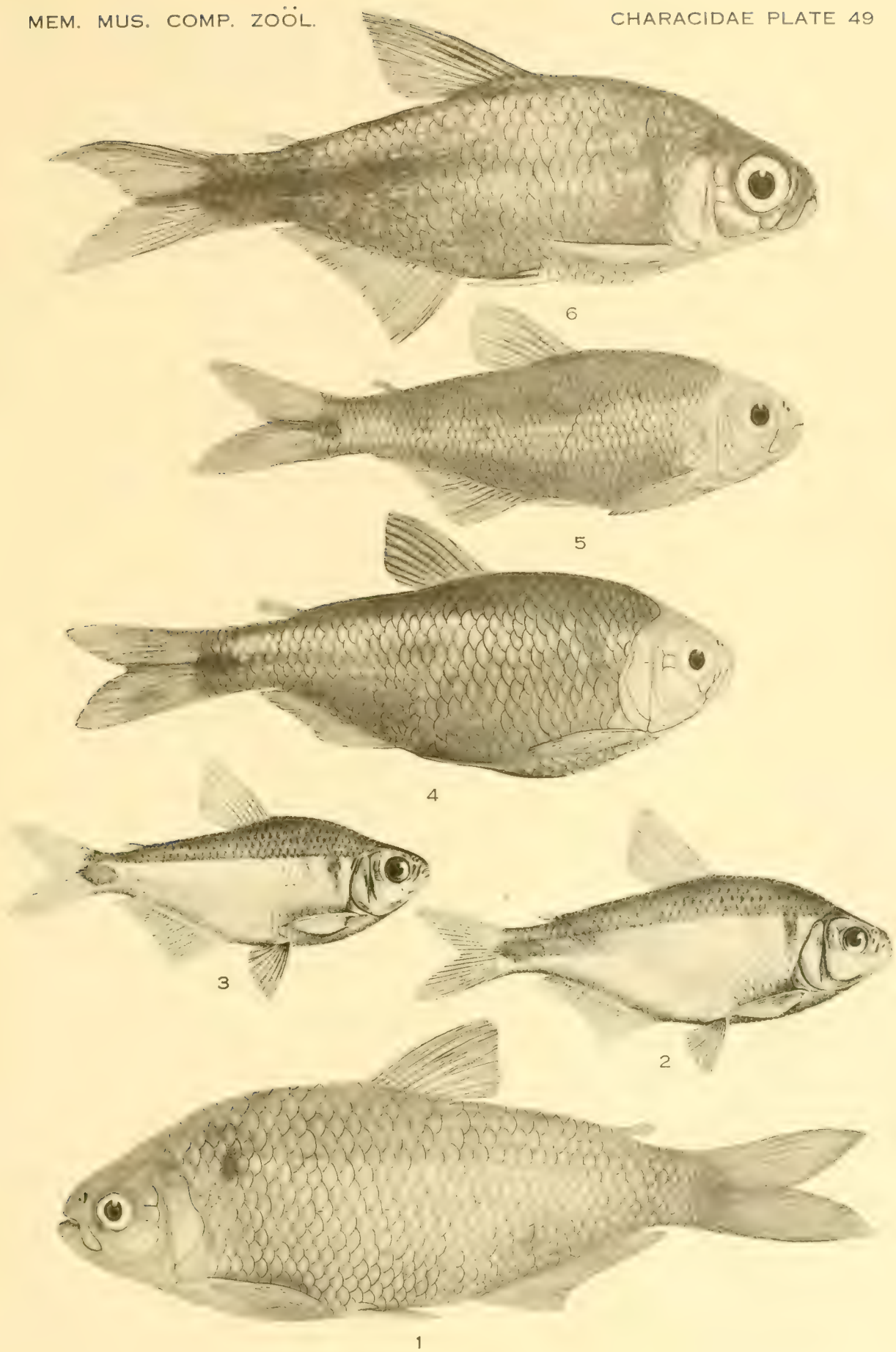








PLATE 50.



PLATE 50.

- Fig. 1. *Astyanax gracilior* Eigenmann.  
20716 M. C. Z. 36 mm. *Type*. Villa Bella, Brazil.
- Fig. 2. *Astyanax fasciatus* (Cuvier).  
After Steindachner.
- Fig. 3. *Astyanax fasciatus jequitinhonhae* (Steindachner).  
20901 M. C. Z. 83 mm. Rio Jequitinhonha, Brazil.
- Fig. 4. *Astyanax multidentatus* Eigenmann.  
20840 M. C. Z. 37 mm. *Type*. Obidos.
- Fig. 5. *Astyanax paucidentatus* (Ulrey).  
20978 M. C. Z. 34 mm. Lago Alexo, Brazil.



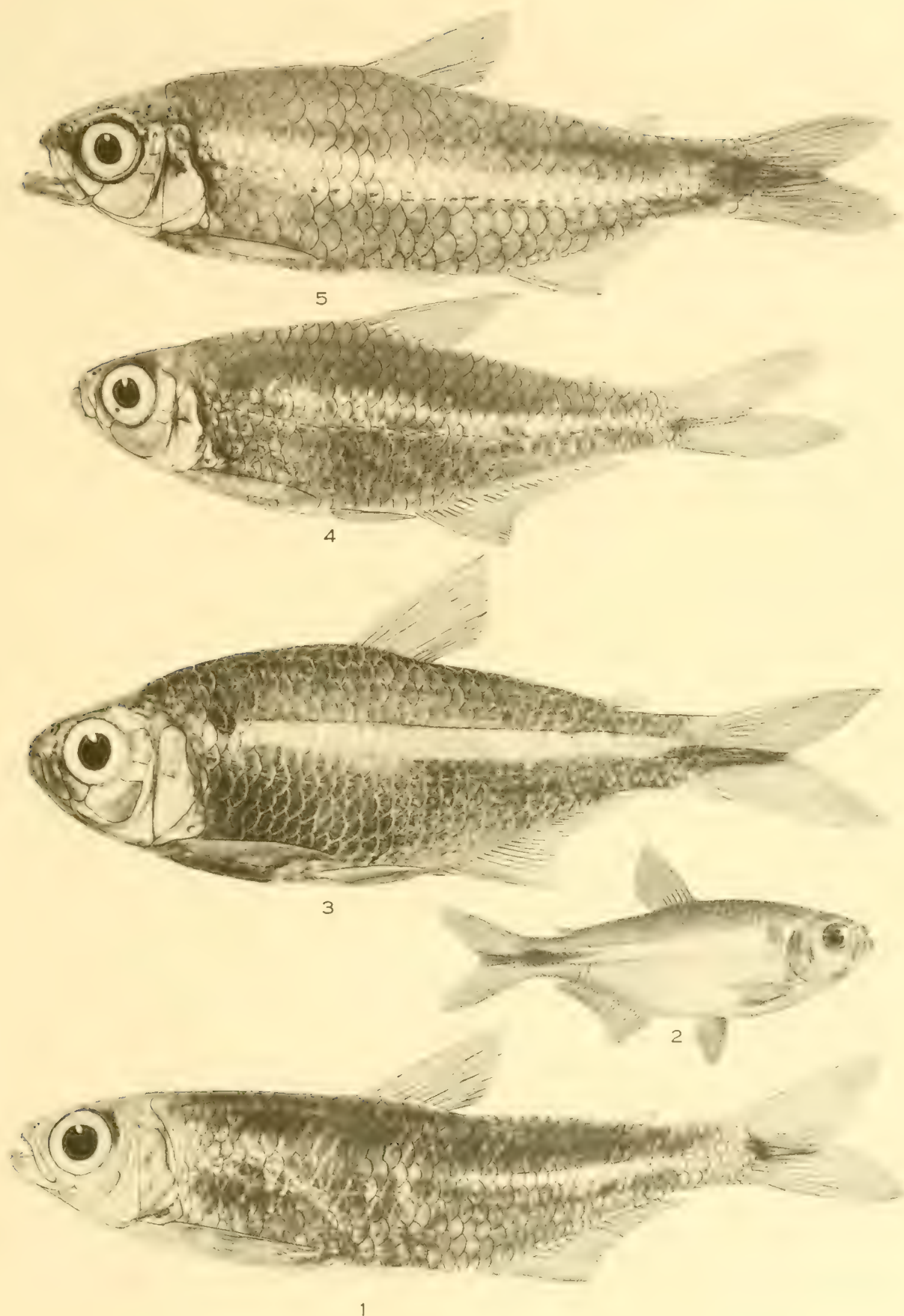








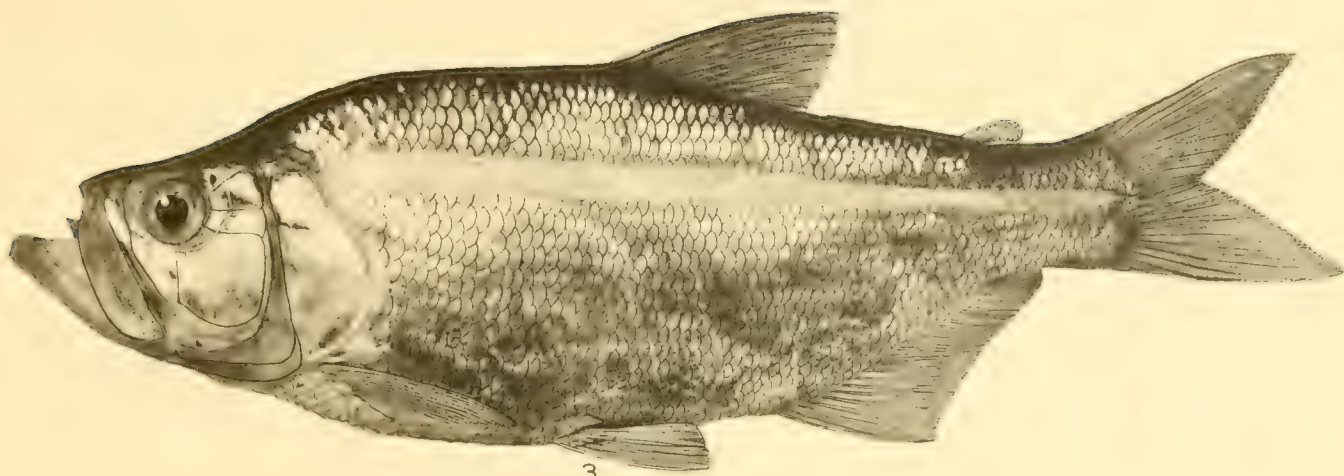
PLATE 51.



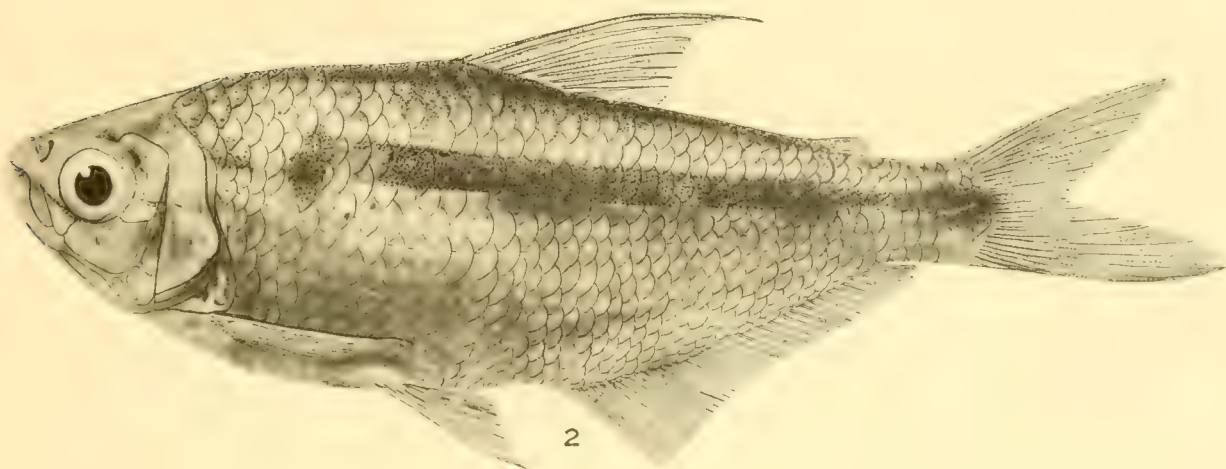
PLATE 51.

- Fig. 1. *Astyanax aurocaudatus* Eigenmann.  
5162 C. M. 60 mm. *Type.* Boquia, Colombia.
- Fig. 2. *Astyanax Zygogaster filiferus* (Eigenmann).  
12847 I. U. M. 110 mm. *Type.* Apulo, Colombia.
- Fig. 3. *Genycharax tarpon* Eigenmann.  
4808 C. M. 174 mm. *Type.* Cartago, Colombia.

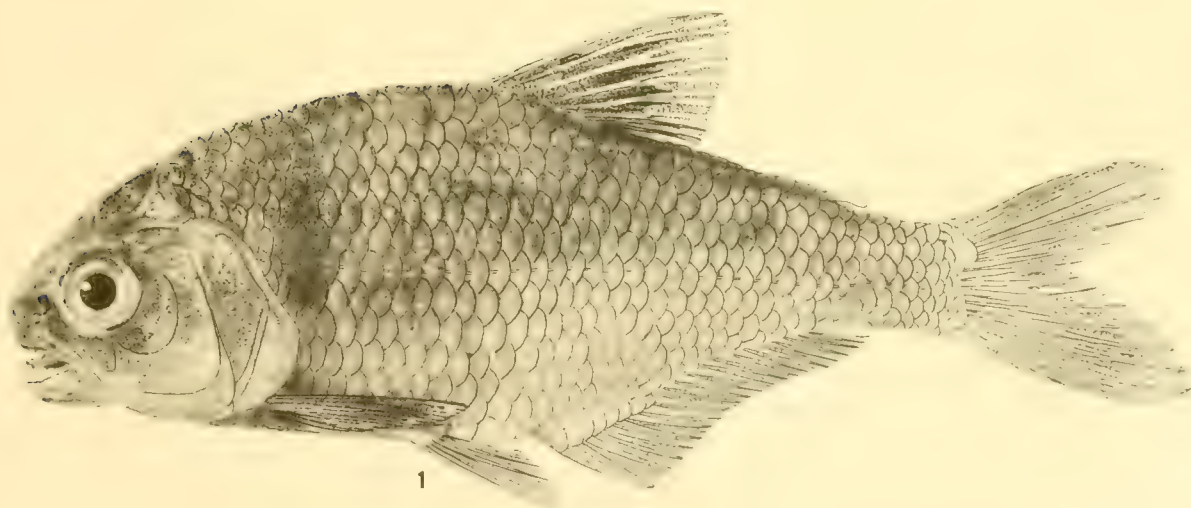




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PLATE 52.

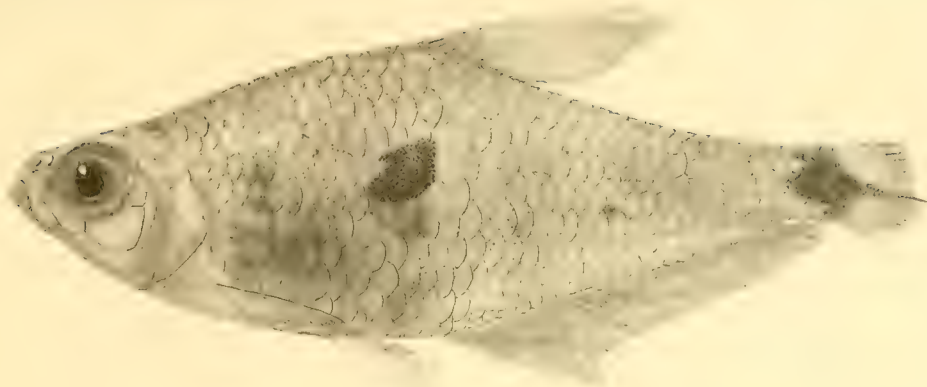


PLATE 52.

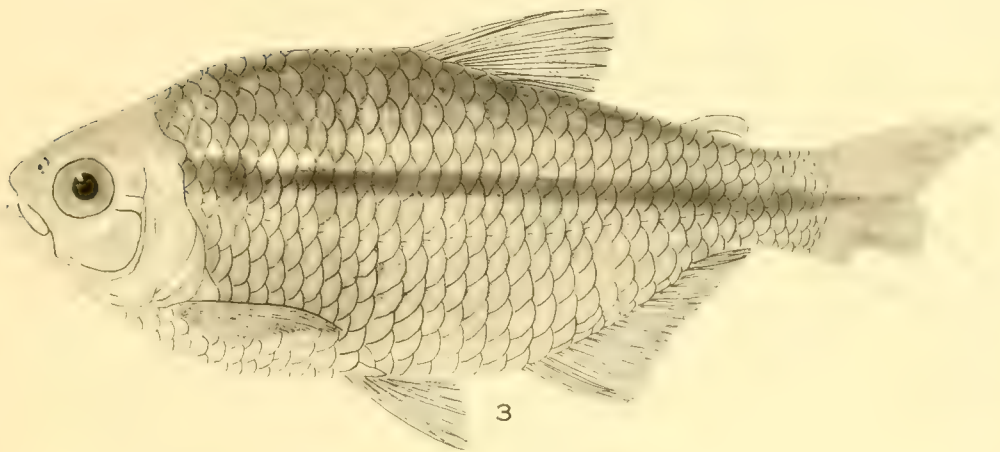
(Annals Carnegie mus., 8, Plate 7).

- Fig. 1. *Astyanax guaporensis* Eigenmann.  
3352 C. M. 33 mm. *Paratype*. Maciél, Brazil.
- Fig. 2. *Astyanax marionae* Eigenmann.  
3353 C. M. 54 mm. *Type*. San Luiz de Caceres, Brazil.
- Fig. 3. *Astyanax bimaculatus novae* Eigenmann.  
3278 C. M. *Type*. Rio Sapon, Brazil.
- Fig. 4. *Vesicatrus tegatus* Eigenmann.  
3201 C. M. 33 mm. *Type*. Jaurú, Brazil.





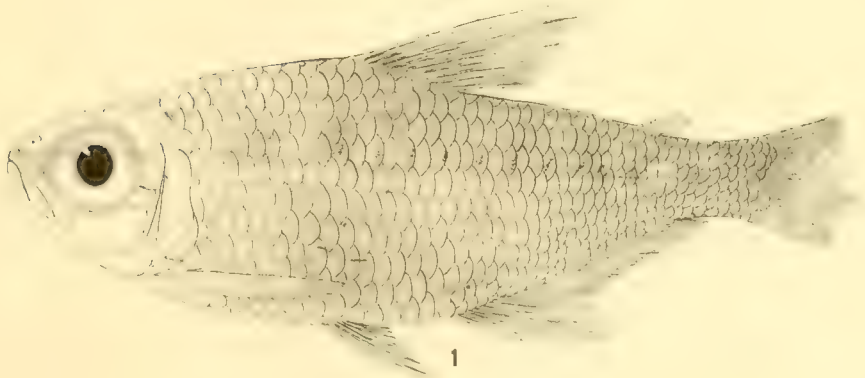
4



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PLATE 53.

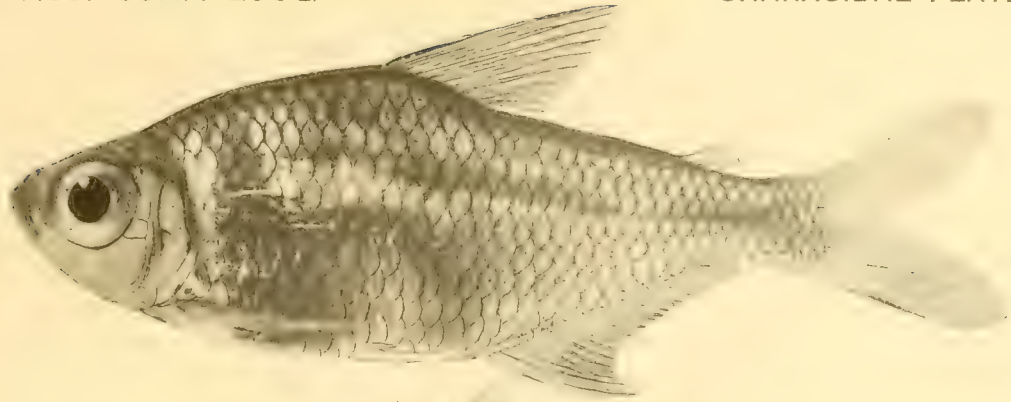


PLATE 53.

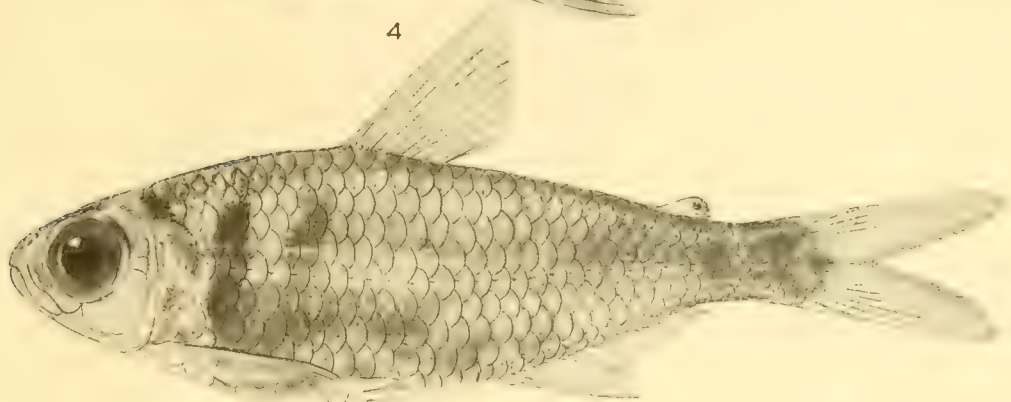
(Mem. Carnegie mus., 5, Plate 51).

- Fig. 1. *Astyanax mucronatus* Eigenmann.  
1025 C. M. 53 mm. *Type.* Tumatumari, British Guiana.
- Fig. 2. *Astyanax mutator* Eigenmann.  
1023 C. M. 53 mm. *Type.* Savannah Landing, British Guiana.
- Fig. 3. *Astyanax essequibensis* Eigenmann.  
1018 C. M. 53 mm. *Type.* Tumatumari, British Guiana.
- Fig. 4. *Astyanax guianensis* Eigenmann.  
1013 C. M. 54 mm. *Type.* Warraputa, British Guiana.

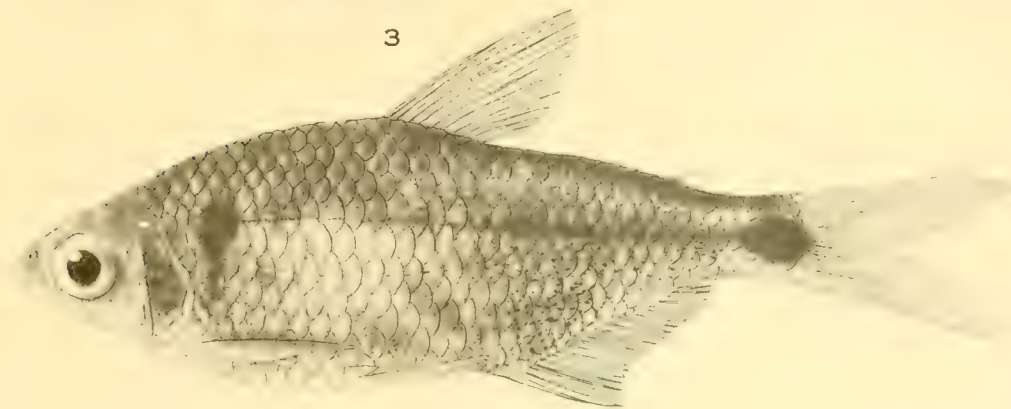




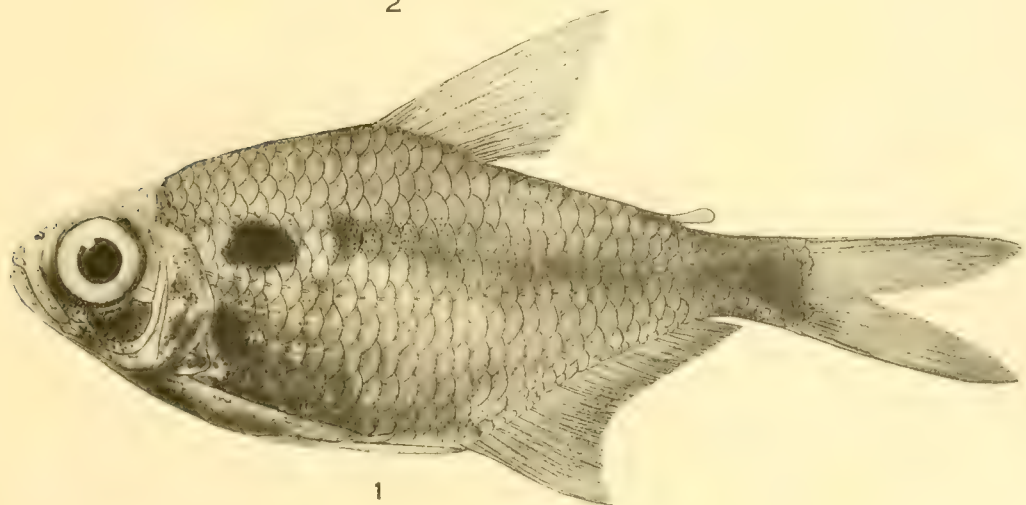
4



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PLATE 54.



PLATE 54.

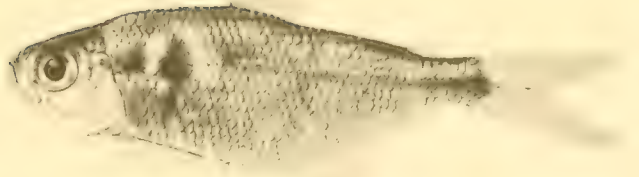
(Mem. Carnegie mus., 5, Plate 52).

- Fig. 1. *Astyanax potaroensis* Eigenmann.  
1037 C. M. 58 mm. *Type.* Amatuk, British Guiana.
- Fig. 2. *Astyanax abramoides* Eigenmann.  
1028 C. M. 112 mm. *Type.* Tumatumari, British Guiana.
- Fig. 3. *Astyanax polylepis* (Günther).  
1419b C. M. 84 mm. Tumatumari, British Guiana.
- Fig. 4. *Astyanax wappi* (Cuvier & Valenciennes).  
From a specimen in British Museum.
- Fig. 5. *Astyanax polylepis* (Günther).  
1419 C. M. 50 mm. Tumatumari, British Guiana.

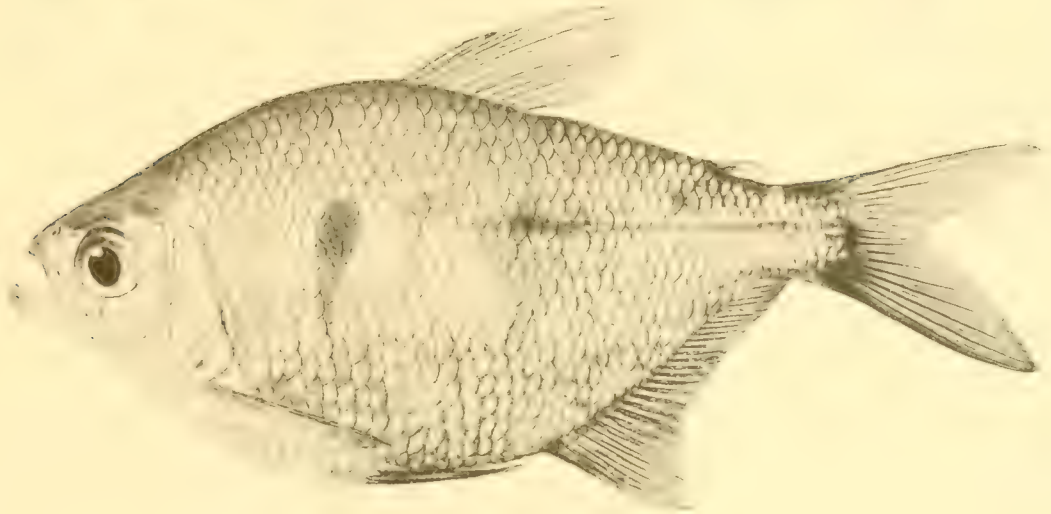




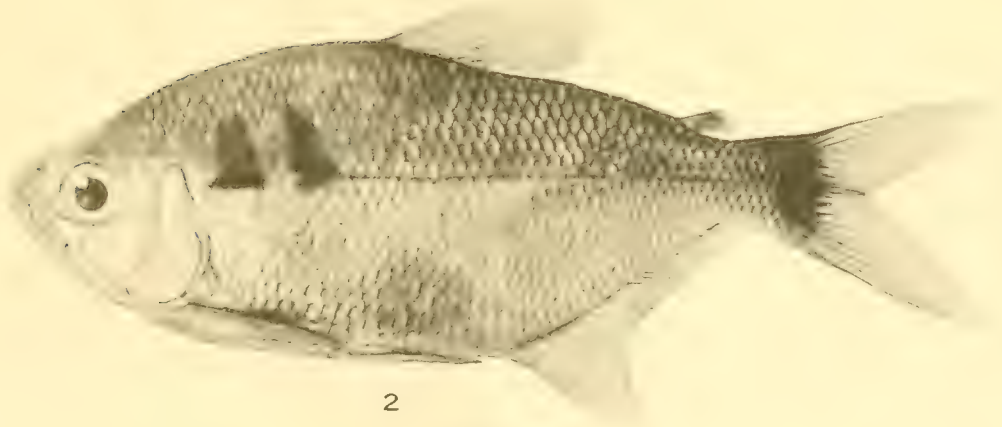
4



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PLATE 55.



PLATE 55.

(Annals Carnegie mus., 8, Plate 8).

- Fig. 1. *Deuterodon acanthogaster* Eigenmann.  
3395 C. M. 54 mm. *Type.* Corumba, Brazil.
- Fig. 2. *Astyanax ribeirae* Eigenmann.  
3368 C. M. 65 mm. *Type.* Xiririca, Southeastern Brazil.
- Fig. 3. *Astyanax paranahybae* Eigenmann.  
3356 C. M. 54 mm. *Type.* Parana-hyba, Brazil.



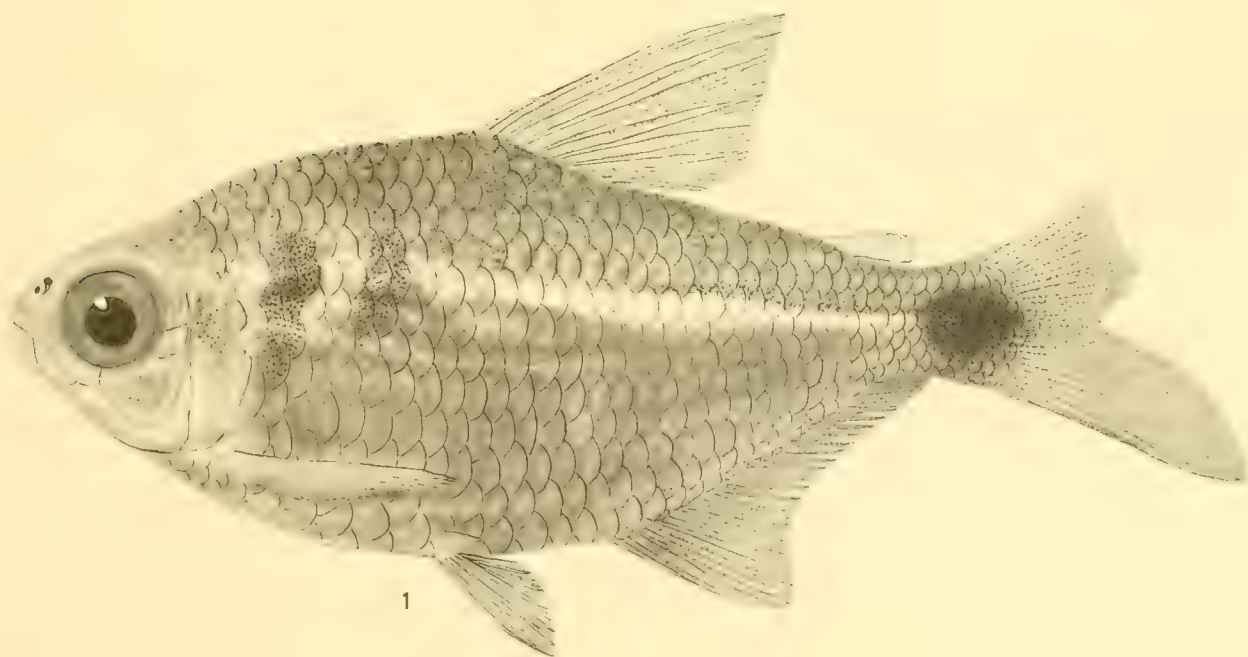
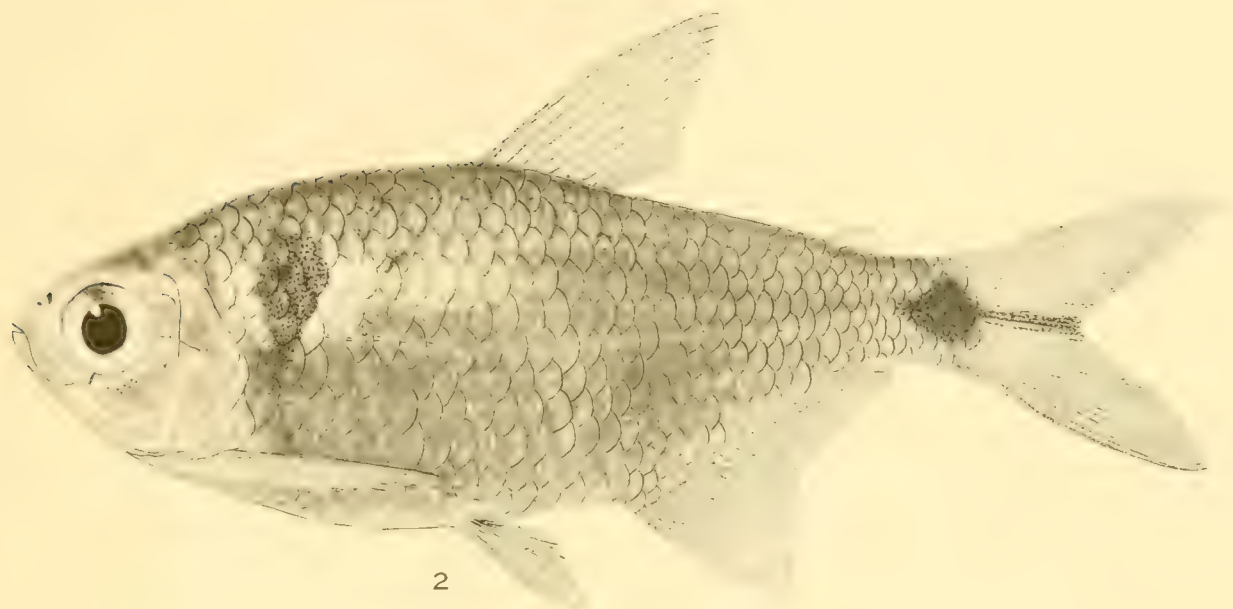
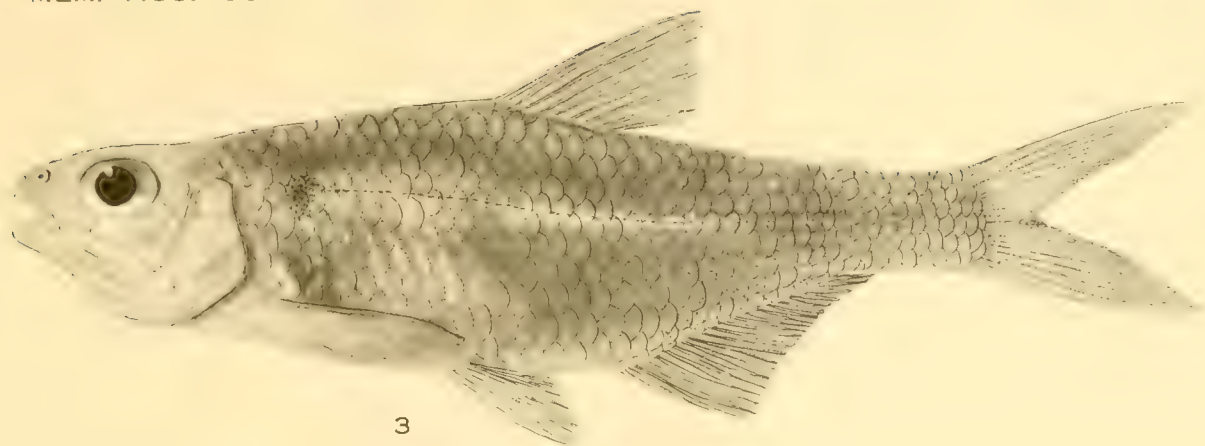








PLATE 61.



PLATE 61.

- Fig. 1. *Poptella longipinnis* (Popta).  
—— I. U. M. *Paratype*. 50 mm. Dutch Guiana.
- Fig. 2. *Astyanacinus moori* (Boulenger).  
From a specimen in the Academy nat. sci. Philadelphia.
- Fig. 3. *Astyanax regani* Meek.  
6257 F. M. 130 mm. Las Cañas, Costa Rica.
- Fig. 4. *Diapoma speculiferum* Cope.  
From the *Type* in the Academy nat. sci. Philadelphia.



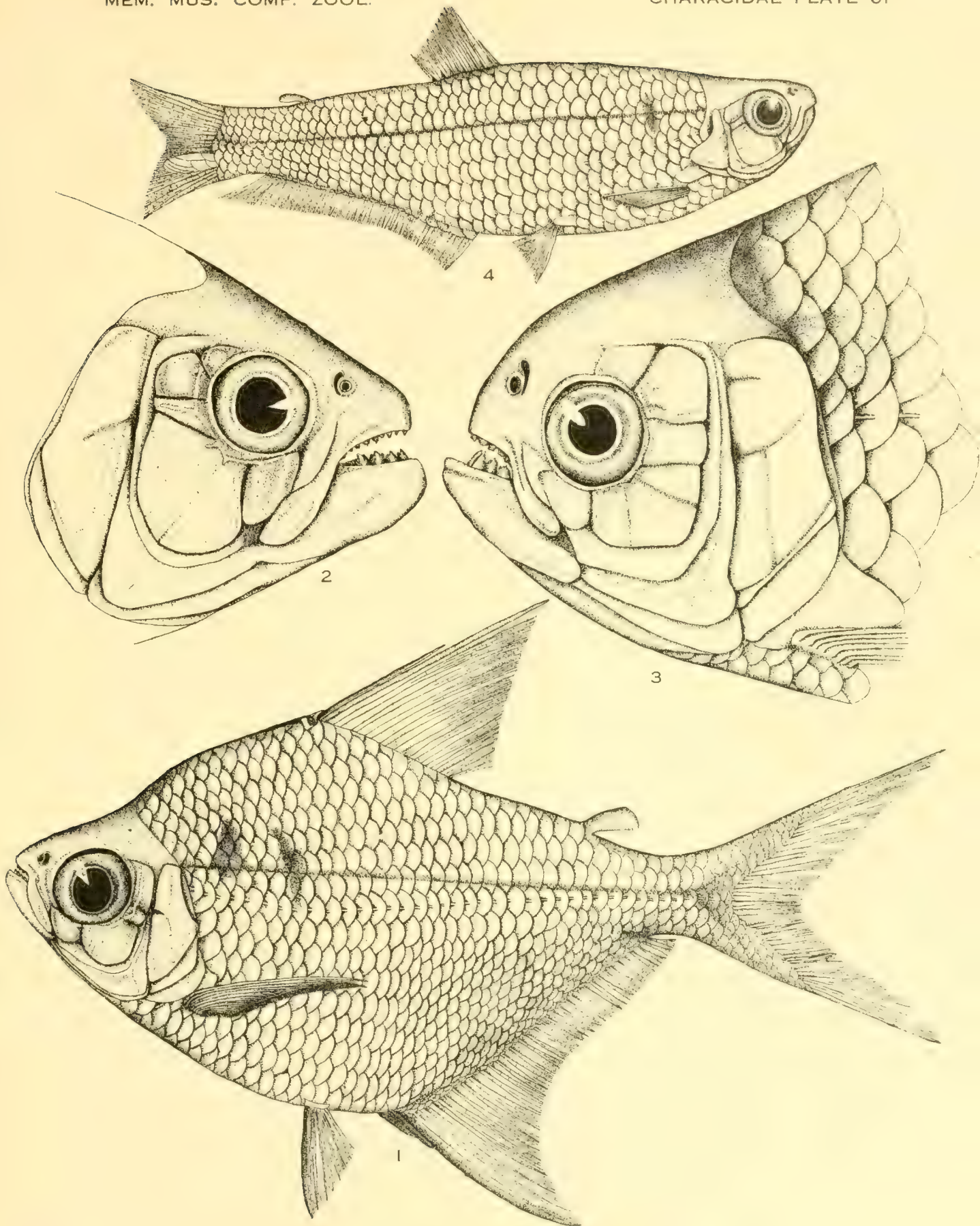








PLATE 62.



PLATE 62.

- Fig. 1. *Astyanax bimaculatus* (Linné).  
21024 M. C. Z. 141 mm. Para, Brazil.
- Fig. 2. *Astyanax bimaculatus* (Linné).  
After *Tetragonopterus jacuhiensis* Cope.
- Fig. 3. *Astyanax bimaculatus lacustris* (Lütken).  
After Lütken.
- Fig. 4. *Astyanax bimaculatus* (Linné).  
After Steindachner.
- Fig. 5. *Astyanax bimaculatus paraguayensis* Eigenmann.  
10239 I. U. M. 30 mm. To show development of the humeral spot.
- Fig. 6. *Astyanax bimaculatus* (Linné).  
11308 I. U. M. 137 mm. Trinidad.



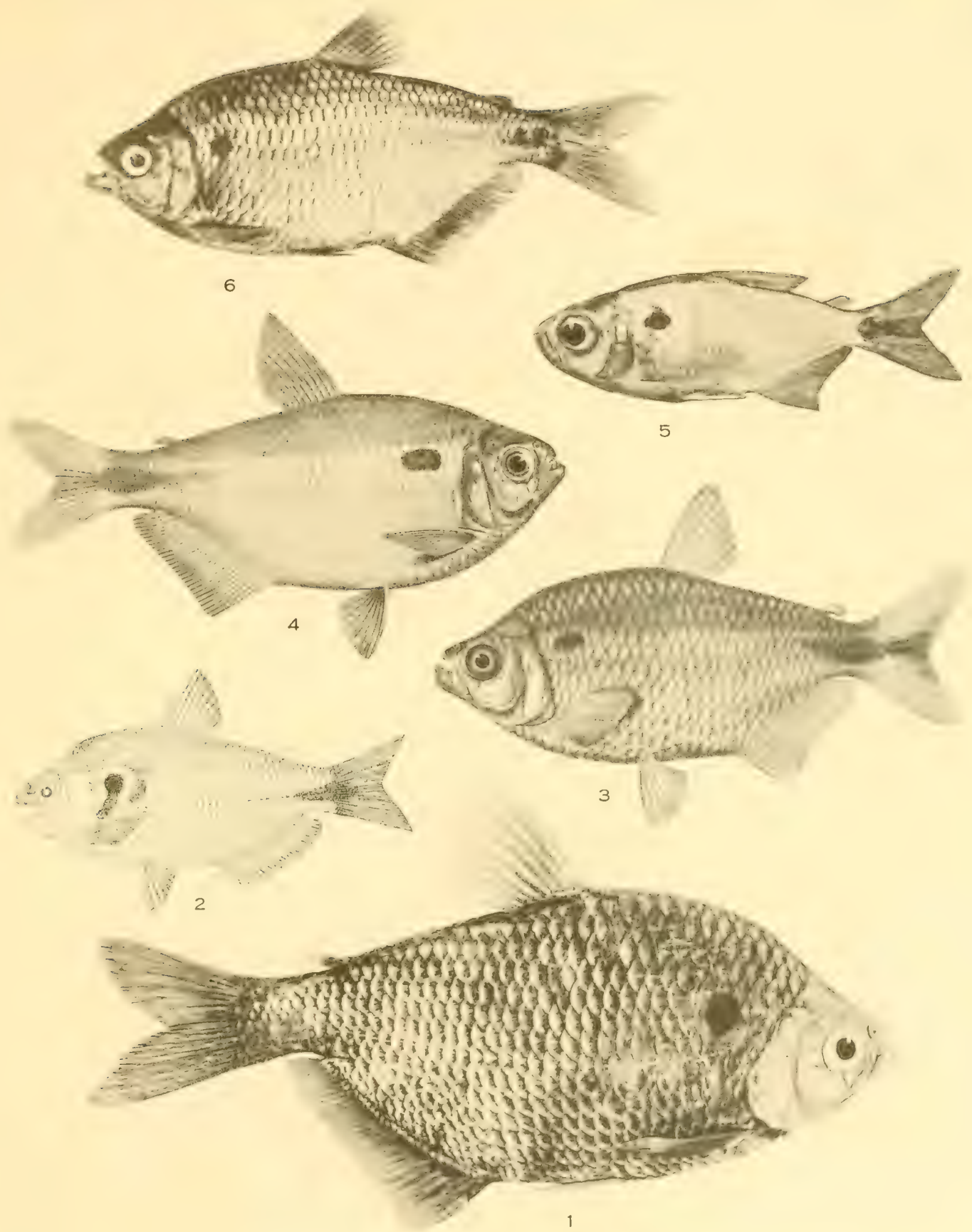








PLATE 64.



PLATE 64.

- Fig. 1. *Hollandichthys multifasciatus* (Eigenmann & Norris).  
9288 I. U. M. 70 mm. *Type*. Cubatão, Southeastern Brazil.
- Fig. 2. Scales of the same.
- Fig. 3. *Pseudochalceus lineatus* Kner.  
After Kner & Steindachner.
- Fig. 4. Mouth of *Hollandichthys*.
- Fig. 5. Mouth of *Pseudochalceus lineatus* after Kner & Steindachner.
- Fig. 6. *Astyanacinus moorii* (Boulenger).  
From a specimen in the Academy nat. sci. Philadelphia.
- Fig. 7. *Scissor macrocephalus* Günther.  
From the *Type* in British Museum.



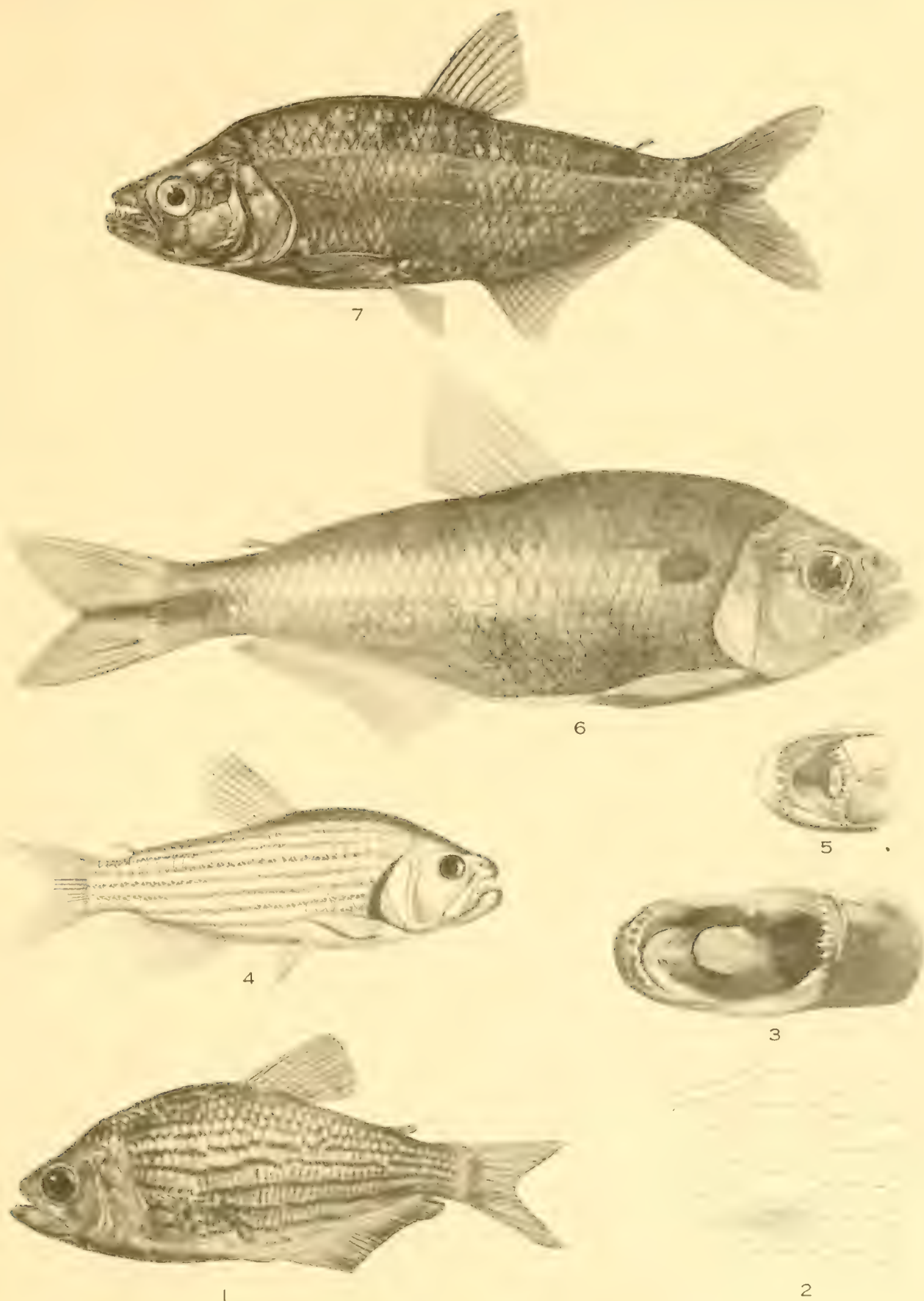








PLATE 66.



PLATE 66.

- Fig. 1. *Henochilus wheatlandi* Garman.  
21109 M. C. Z. 420 mm. *Type*.
- Fig. 2. Fifth left premaxillary tooth.
- Fig. 3. One of the inner premaxillary teeth.
- Fig. 4. Fifth right dentary tooth.
- Fig. 5. *Astyanax nicaraguensis* Eigenmann & Ogle.  
From a specimen in the U. S. N. M.
- Fig. 6 and 7. *Astyanax nicaraguensis* Eigenmann & Ogle.  
Maxillaries.
- Fig. 8. *Deuterodon nasutus* (Meek).  
11600 I. U. M. 100.5 mm. *Paratype*. Managua.



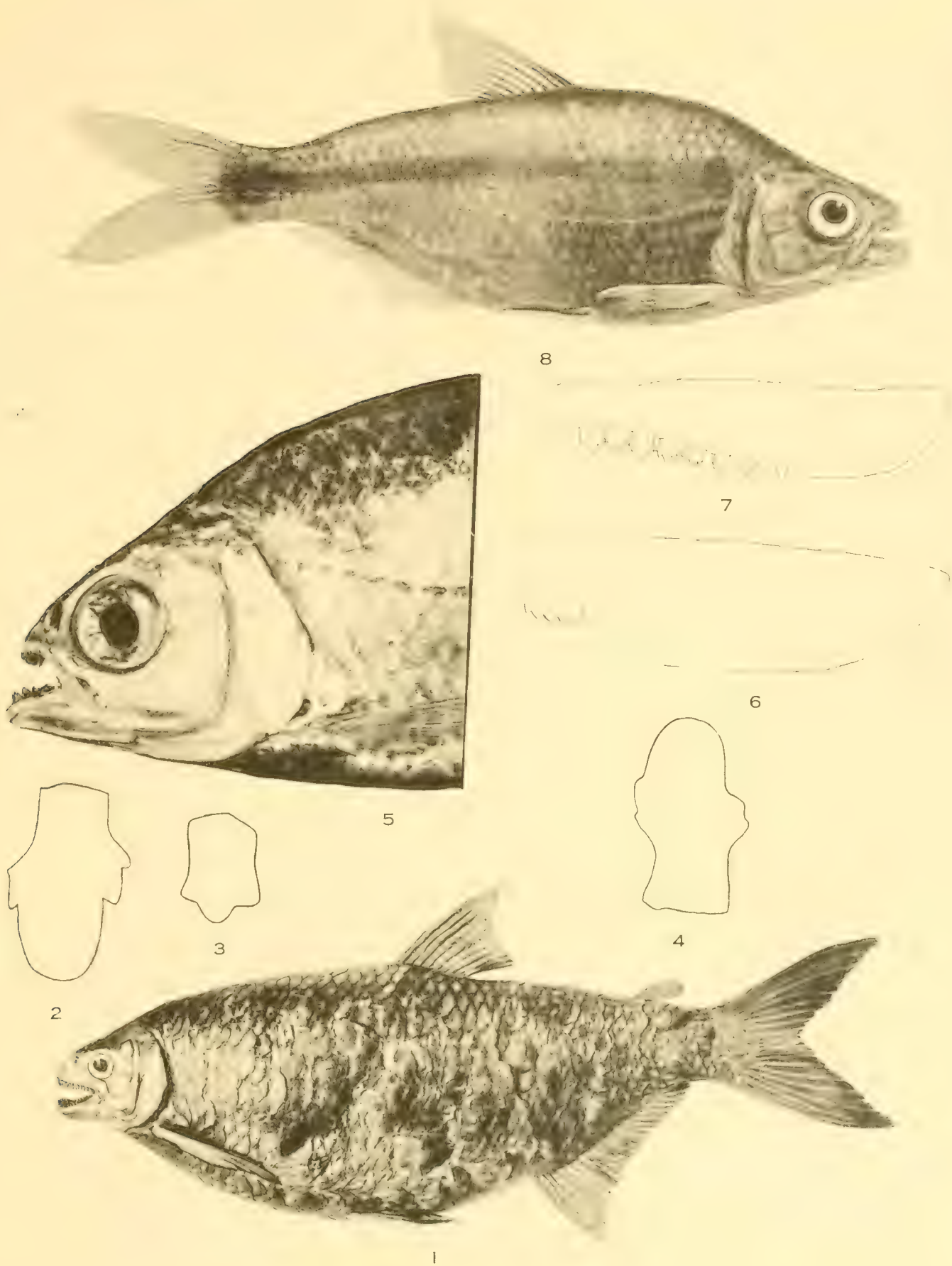








PLATE 69.



PLATE 69.

- Fig. 1 and 2. *Hemibrycon ipanquianus* (Cope).  
21114 Acad. nat. sci. Philadelphia. Camera outline of the *Type*.
- Fig. 3. *Astyanax longior* (Cope). Camera outline of the *Type*.
- Fig. 4. Open jaws of same.
- Fig. 5. *Bryconamericus phoenicopterus* (Cope).  
8074, Acad. nat. sci. Philadelphia. Camera outline of a *Cotype*.
- Fig. 6. Maxillary of *Astyanax aurocaudatus* Eigenmann.
- Fig. 7. *Bryconamericus simus* (Boulenger).  
11598 I. U. M. Camera outline of a *Cotype*.
- Fig. 8. Mandible *Astyanax aurocaudatus* Eigenmann.
- Fig. 9. Mandibular teeth of a *Bryconamericus phoenicopterus* (Cope).
- Fig. 10. *Astyanax aurocaudatus* Eigenmann. Arrangement of the premaxillary teeth.
- Fig. 11. *Bryconamericus diaphanus* (Cope).  
21217 Acad. nat. sci. Philadelphia. Camera outline of a *Cotype*.
- Fig. 12. Dentition of the same, as seen from the side.
- Fig. 13. *Bryconamericus eigenmanni* (Evermann & Kendall).  
11071 I. U. M. Camera outline of a *Cotype*.



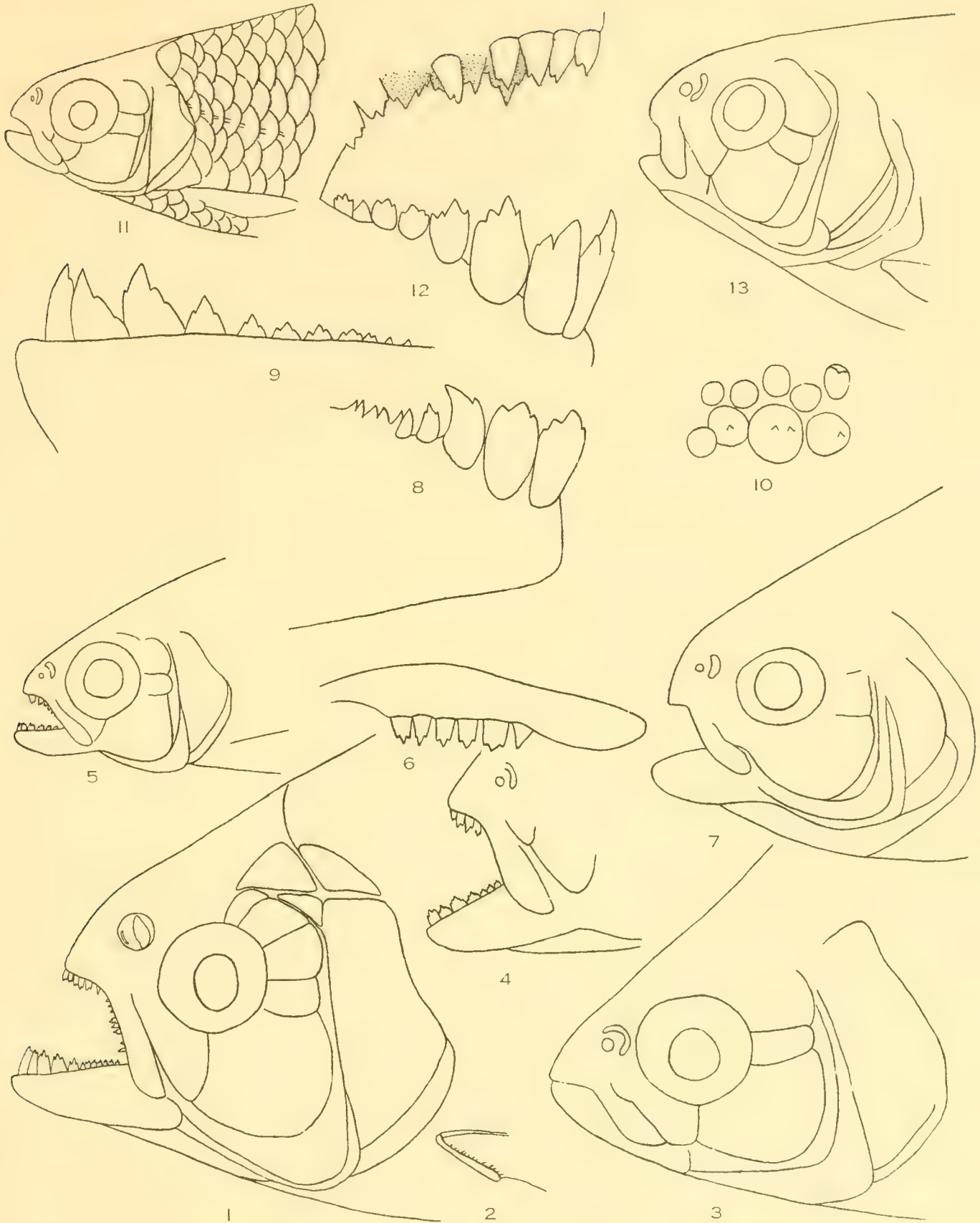








PLATE 85.



PLATE 85.

(Proc. Academy nat. sci. Philadelphia, 1907).

- Fig. 1. *Hemibrycon ipanquianus* (Cope).  
21114 Phila. Academy. 97 mm. *Type.* Urubamba.
- Fig. 2. *Astyanax longior* (Cope).  
21222 Phila. Academy. 79 mm. *Type.* Peruvian Amazon.
- Fig. 3. *Bryconamericus phoenicopterus* (Cope).  
8092 Phila. Academy. Length about 57 mm. *Type.* Ambyiacu.
- Fig. 4. *Bryconamericus diaphanus* (Cope).  
21216 Phila. Academy. 52 mm. *Type.* Peruvian Amazon.



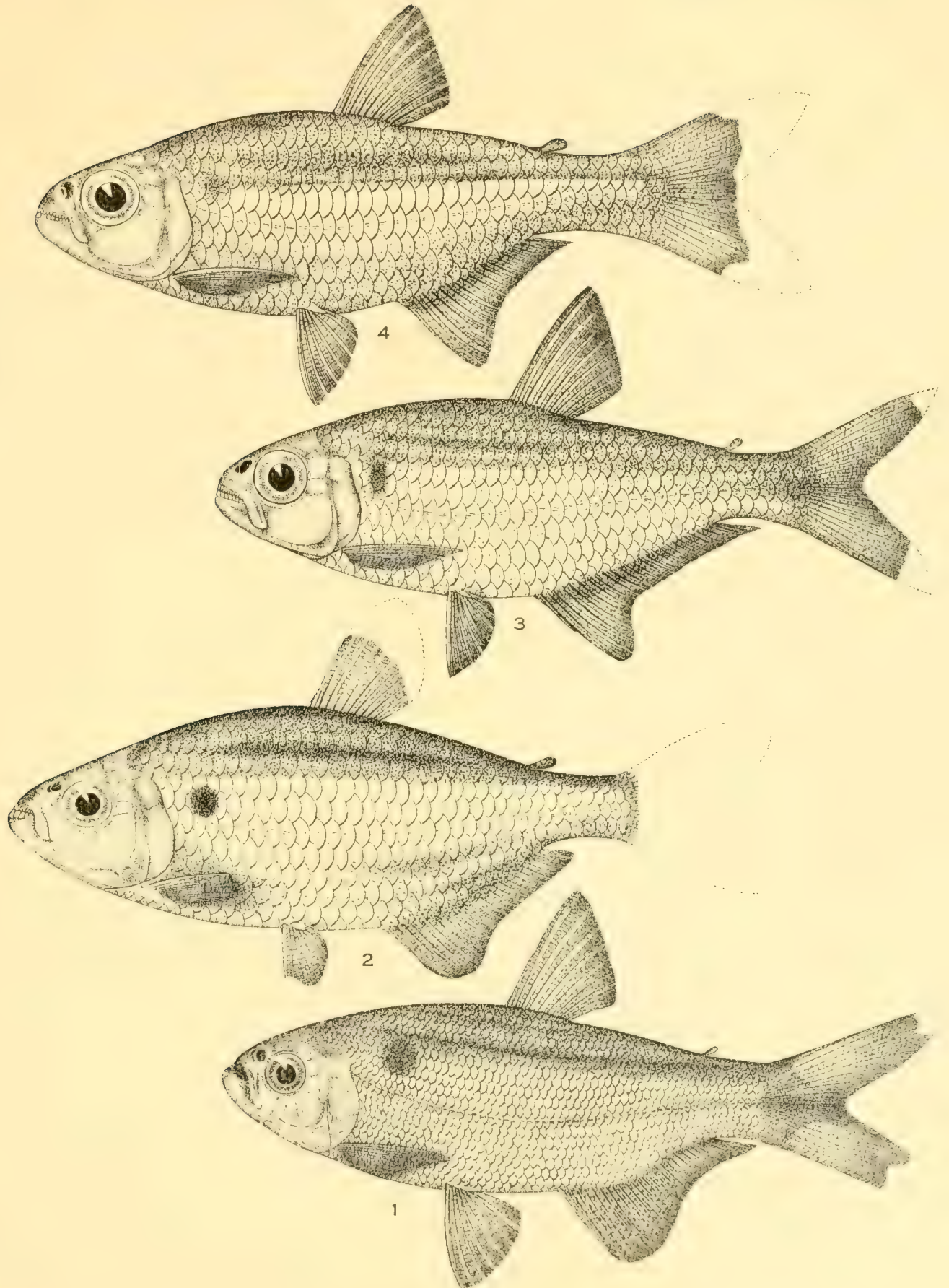








PLATE 87.



PLATE 87.

Fig. 1-3. *Astyanax maximus* (Steindachner). (Sitzb. K. akad. wiss. Wien, **72**, pl. 7.)

Fig. 4. *Astyanax metae* Eigenmann.

13371 I. U. M. 140 mm. Barrigon, Colombia.



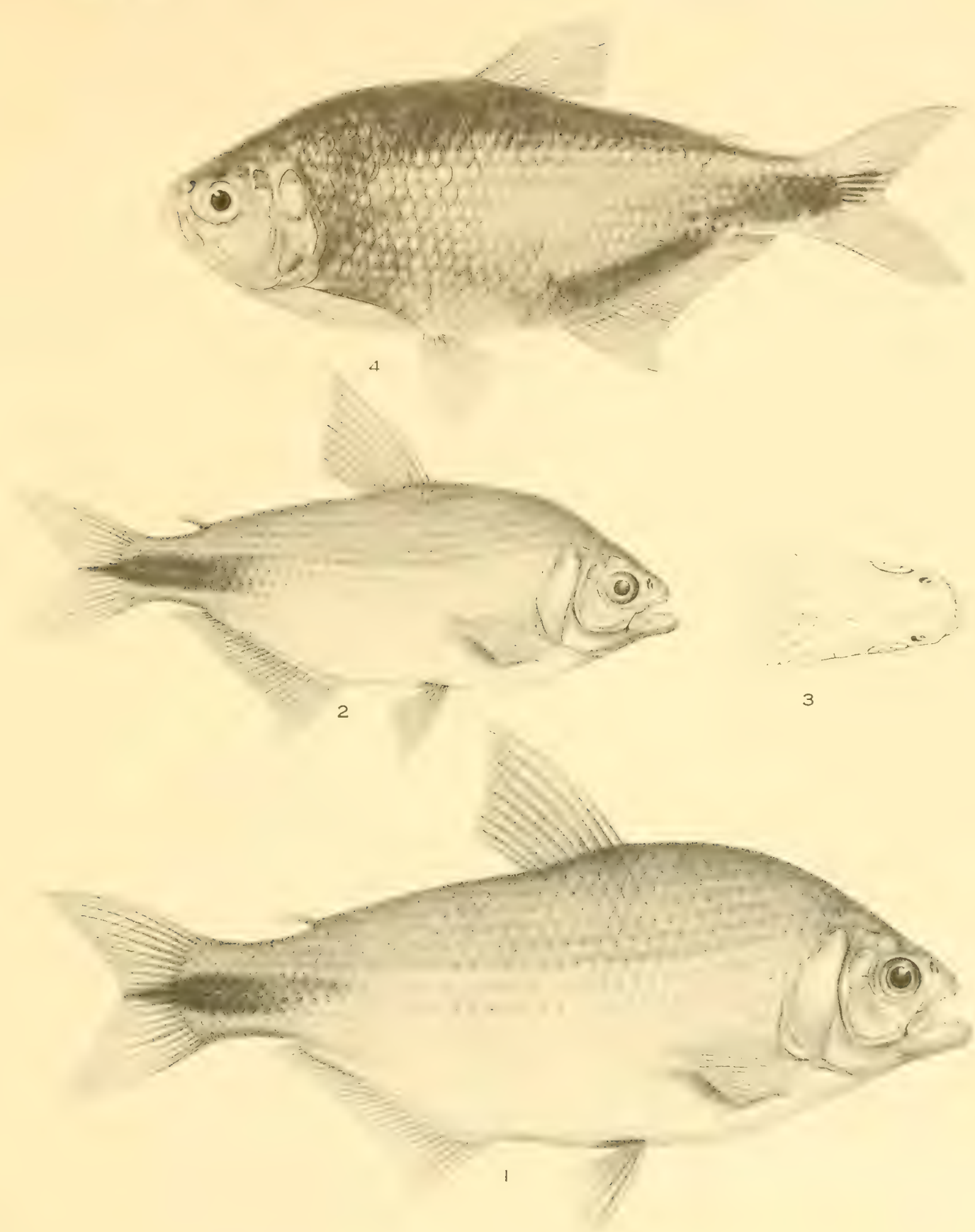








PLATE 89.



PLATE 89.

- Fig. 1. *Microbrycon minutus* Eigenmann and Wilson.  
5422 C. M. 24 mm. *Type.* Truando, Colombia.
- Fig. 2. *Piabina analis* Eigenmann.  
5478 C. M. About 37 mm. *Type.* Caceres, Brazil.
- Fig. 3. *Astyanax fasciatus heterurus* Eigenmann.  
5392 C. M. 50 mm. *Type.* Truando, Colombia.



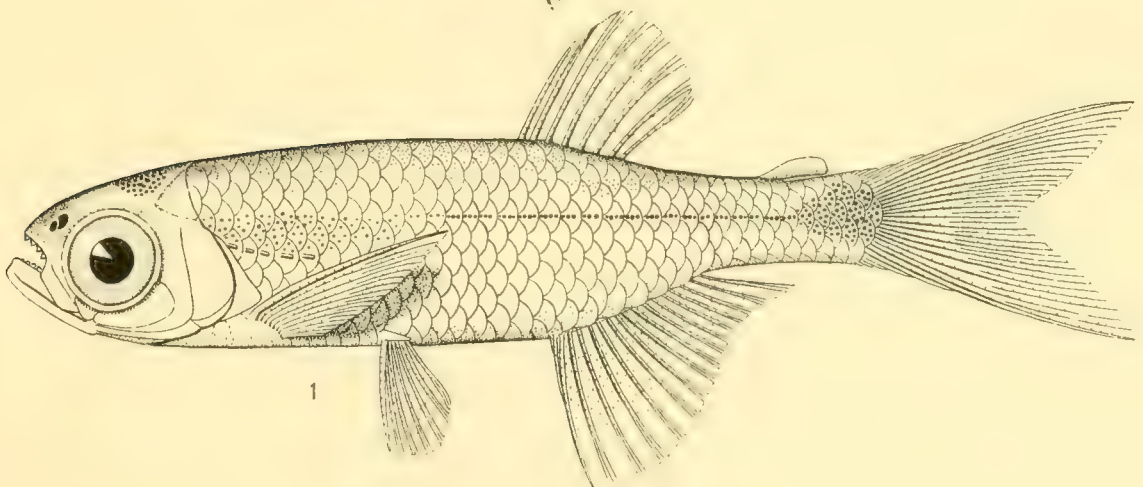
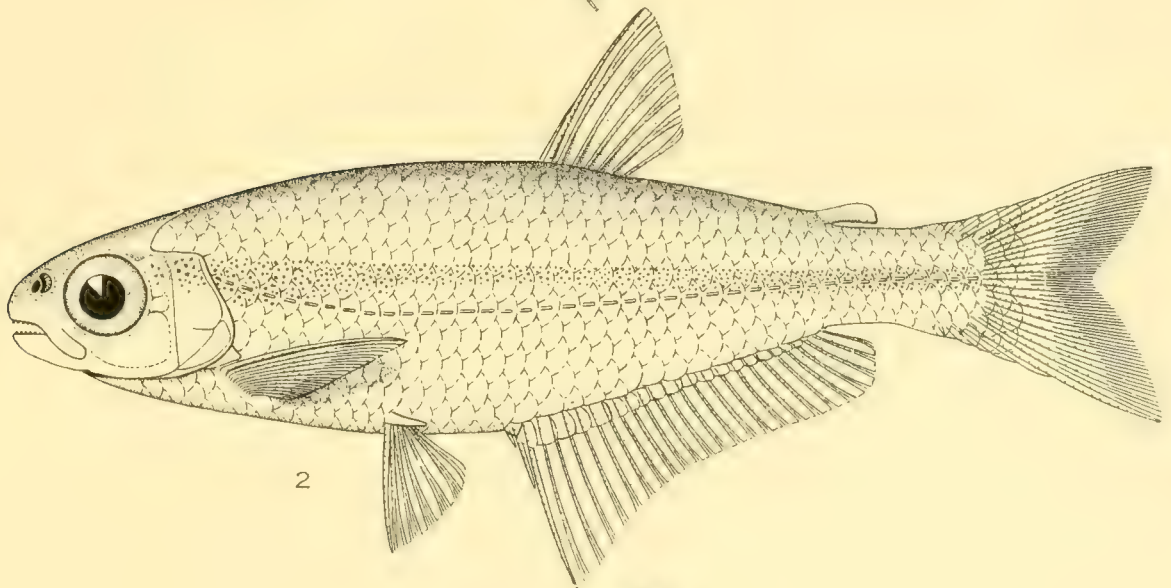
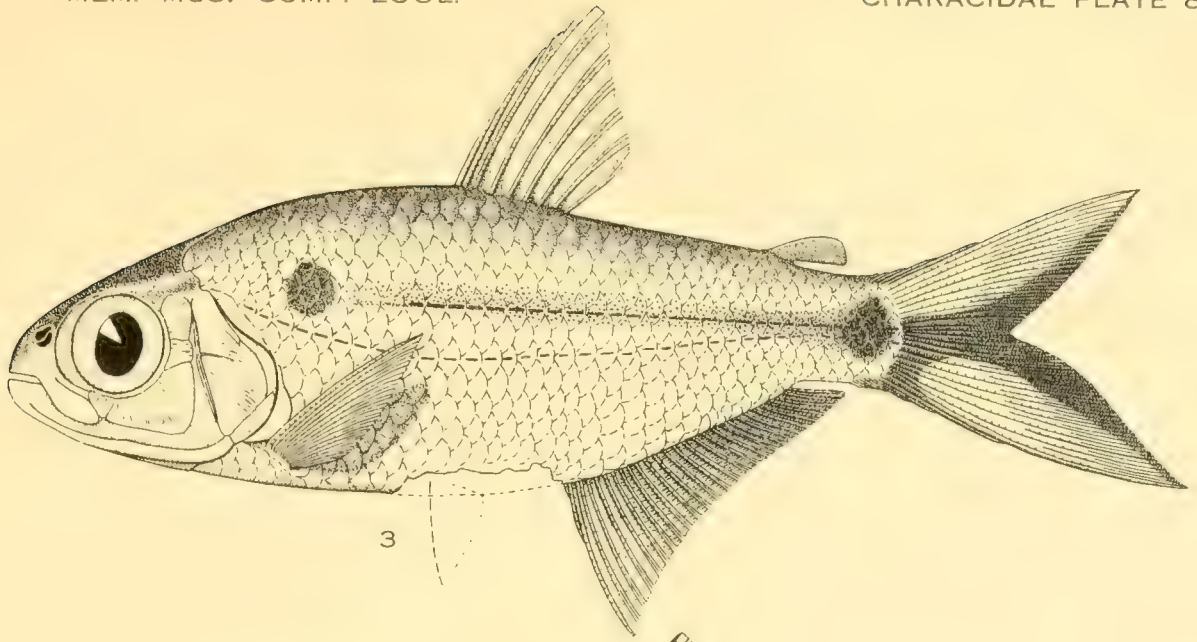








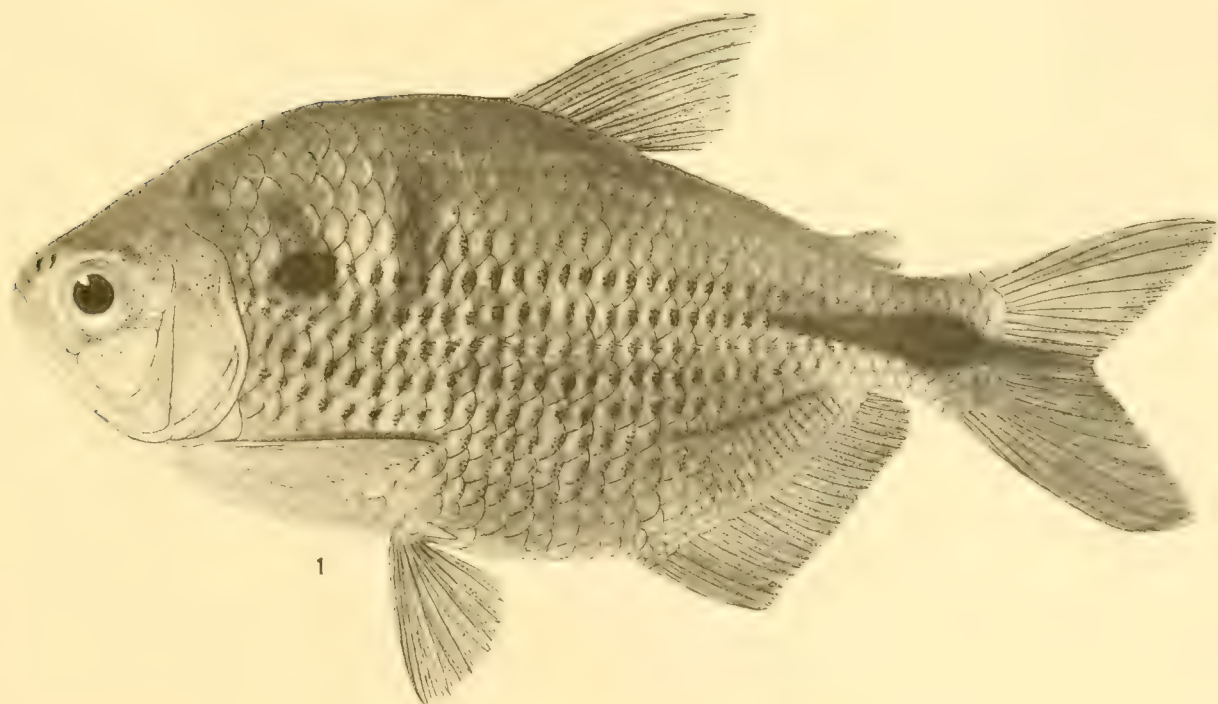
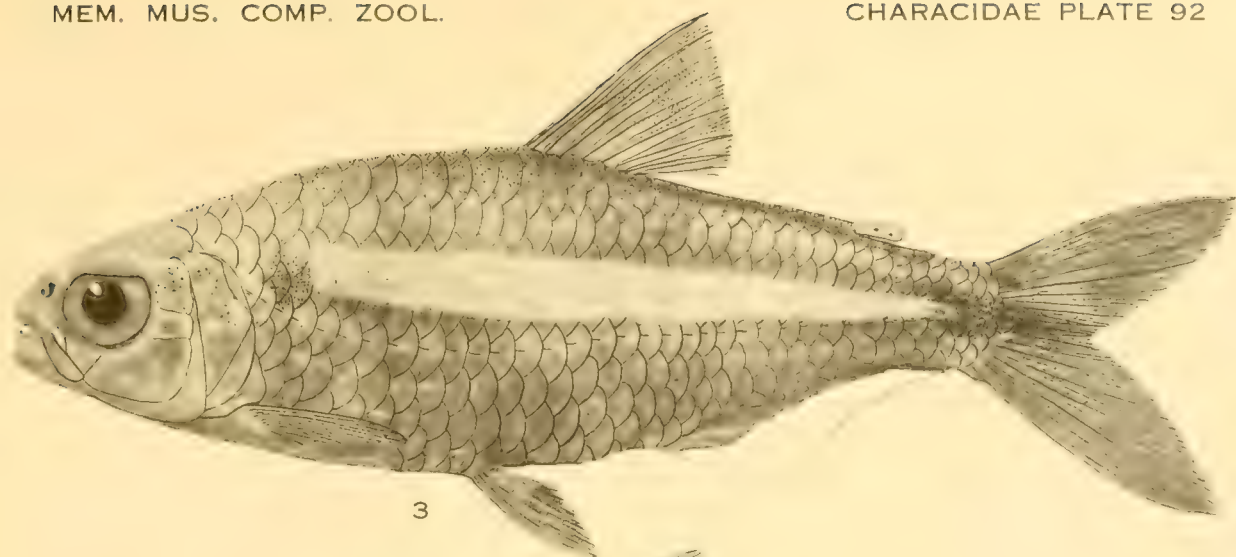
PLATE 92.



PLATE 92.

- Fig. 1. *Astyanax bimaculatus paraguayensis* Eigenmann.  
3281 C. M. 96 mm. Sapucay, Paraguay.
- Fig. 2. *Astyanax hasemanni* Eigenmann.  
5476 C. M. About 55 mm. *Type*. Porto Alegre, Southeastern Brazil.
- Fig. 3. *Bryconamericus novae* Eigenmann & Henn.  
3568 C. M. 58 mm. *Type*. Below Cachoeira da Velha de Rio Nova, Brazil.















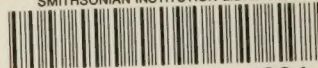








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